



FRIDAY, MAY 2.

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## The Needles Bridge—Correction.

In the article on the Needles Bridge in the last issue of the *Railroad Gazette*, the name of the Chief Engineer of the Atlantic & Pacific should have been given as S. M. Rowe.

## Standard Rail Sections.

We continue the publication of letters received on this important subject. We regret that we cannot give the names of all the writers, as they are men so well known that their names would carry great weight. In fact, they are representative men. The first one given in this issue is from one of the greatest producers of steel rails in the country.

A Rail Maker: I have no personal opinion as to the best form of standard rail. This, because I have not the requisite information upon which to base an intelligent opinion. I am, however, decided in my opinion that it would be to the best interest of the rail makers and rail users if the committee of the Am. Soc. of Civil Engineers would formulate the data they may gather, and submit and adopt a standard, so far as they are able to do so, which is, in their judgment, the best attainable up to date; this to be known as The Engineers' Standard Section. There is no question but that it would be a good section from the standpoint of both the rail makers and rail users. It certainly would not be perfect, and would not satisfy every one. If they delay their report until this last end is attained it will never be made. Neither does it follow that a perfect standard should be fixed upon before they are justified in making a report, or that anything short of a perfect standard would be valueless. It is the opinion of the writer that a standard sanctioned by the American Society of Civil Engineers would be of great value both to producers and to a large class of consumers. It is his experience that there is quite a large class of consumers who are not well informed as to relative merits of the different sections, and are ready to adopt any section that interested parties may advise, with the result that no one section is coming into general use. If, on the other hand, there was a section that would be known throughout the country as "standard" it would generally be adopted by this class, and as it to any considerable extent became generally known and used the rail makers would naturally feel justified in carrying small stocks on hand. They would then become interested parties to advise its adoption, and so conduce to its general use. It would develop that money could be more easily borrowed on a lot of "standard" rails than any other section. The fact that it was called and generally known as "standard" would give increased value. This is demonstrated in the case of light sections, 40 lbs. and below. Nearly all the makers have adopted one set of patterns, and make it a point to carry in stock enough of each weight to fill reasonable sized orders; and when rolling on large orders, they feel safe to overroll and place the excess in stock. This has worked so well that the mills whose patterns did not correspond to this set of sections have found it to their interest to make new rolls.

A. E. Hunt, Member Am. Soc. C. E.: I voted for the discontinuance of the committee, believing that a standard rail section was not at present, with the very unsettled state of opinions, in the power of the American Society of Civil Engineers to recommend. I agree with Mr. Whittemore's position, that as the matter now stands it is in the province of the individual engineers, rather than the Society, to devise sections to meet the given wants. At the same

time, I am, on the whole, glad that the committee was continued, and consider that the "threshing out" of the facts which they will be able to do in the future will be of great service. Of course, every one who has any knowledge of the matter agrees as to the benefits of standard sections, and as to the very great cause of trouble the varying sections now are. At the same time, the question of the section has not been yet definitely settled. I know that a good many engineers have ideas contrary to the Michigan Central design of Mr. Hawks. My own mind is not made up as to the best section, and I am not prepared to give you any reasons pro or con, more than the very voluminous discussion which is already out and in print on the subject.

F. M. Wilder, Member of the Committee: On the whole, I agree that the Am. Soc. C. E. should go slow in the matter of final adoption of any standard, even if it is desirable from a point of convenience and economy to bring the practice of the country to a standard. Conditions are changing continually, and a rail and wheel section which were suitable but a few years ago under the then conditions of a maximum load of say 6,000 pounds per wheel on freight cars and 7,000 to 8,000 on passenger cars and 12,000 on locomotives, will not do under present practice of 12,000 pounds on freight cars and as high as 21,000 to 22,000 on locomotive driving wheels. The very elaborate report of the committee on proper relation to each other of the sections of railway wheels and rails shows that the tendency is to get a rail with a flatter head, and the action of the M. C. B. Association in adopting a standard wheel section with very much less cone than the old practice, brings into the problem entirely a new condition of things. This new wheel section has not been in use to determine what effect it will have upon the wear of rails, as it is not probable that more than 10 per cent. of the wheel mileage of the country is made with wheels having the standard section. While this is the case and the exact form of the head may not be agreed upon, the relative proportions of the head to the web and flange which will give the greatest strength and stability to the rail can be determined. I, therefore, think that a report of the committee can be made which will help to bring the practice of the railroads to uniformity in all matters excepting the shape of the head in the relation of the wearing surfaces of the wheel and rail. Such a standard would lessen the number of styles of splices, chairs, braces, bolts, etc. A further examination of the whole subject may tend to modify the opinions of the engineers in regard to the proper shape of the wearing surfaces. A report of the committee need not be adopted by the society as a standard except for trial, and it is probable that the committee would find difficulty in making a unanimous report if the report is to be adopted as a standard without reservation. From my own standpoint, I believe in the flat top rail, but with the cylindrical wheel, and that there will be much less wear with them than with the round topped. It is impossible for a cone to run upon a plane held in relation to each other as the wheel and rail are, without the larger periphery of the cone moving faster than the smaller, and with, of course, the corresponding wear to both. I think the subject will still bear a great deal of investigation and discussion.

A Member American Society Civil Engineers: As you are aware, the Committee of the American Society of Civil Engineers would simply recommend in the report certain sections as standard, and the society would only adopt the report. The society does not undertake to express an opinion upon the sections recommended by the committee. The effect upon the public of a committee report accepted by the society is, however, the same as if the society as a body indorsed the views expressed. This is unfortunate, for some good can be accomplished by the adoption of standard sections, for the time being at least. As you know, the rail mills are now required to keep on hand a large stock of rolls in order to be able to furnish sections, for which in many cases there is no justification whatever excepting the whim of the designer. Many railroads seem to be actuated by the desire to have their own rail section simply for the name of it, and to be unwilling to adopt the section of another company because the rail is known by the other company's name. I do not think that the time has come when we can fix upon certain sections and say that we know them to be the best. The committee of the American Society of Civil Engineers will base its report upon what, to my mind, is very unreliable data. Furthermore, I think that the loads upon wheels now in vogue upon our railroads will be further increased, and this may make it desirable in time to change radically our form of rail. So long as the wheel loads are undergoing rapid changes, I consider it premature to adopt standard rail sections. The committee's report will be of value to those who are not in a position to have opinions of their own. It will do harm from the fact that it will tend to retard individual examination, investigation and observation upon a subject that needs them very much.

## The Works of the Martin Anti-Fire Car Heater Co.

These works are, as is well known, at Dunkirk, N. Y., on the line of the Lake Shore & Michigan Southern. The buildings and general arrangements have been de-

scribed already in these pages. The principal building is the machine shop, two stories high, with a large basement, which is utilized for a workshop and storehouse. This building is already too much crowded, and a new brick building is soon to be built—the foundations are already laid—into which the pattern work and storage will be transferred.

An elevator runs from the basement to the second floor, and carries both the workmen and work from floor to floor. On the second floor are all of the small machinery and the tool room, also the drawing room and a nickel plating department. In the basement are the polishing wheels, a large, well-ordered store room and engine room and experimental apparatus. The basement floor is on a level with the grounds at the rear of the works, and there are located the brass and iron foundries.

In the brass foundry there are five melting pits and facilities for doing good work. In the iron foundry are one cupola and a well-lighted molding floor. The work being small in size, cranes are hardly needed. The coal, molding sand and coke are delivered directly from the railroad into bins with top openings. The bottoms of these bins are directly on a level with the foundries.

Some very ingenious tools are to be seen at these shops, the inventions of Mr. D. A. Barnes, Superintendent of the works. Much of the machinery is of special design, made to suit the work of the company. Among others may be mentioned a multiple tapping machine for pipe fitting, a large tool of considerable capacity; a milling machine for spanner nuts, which has five cutters, and mills five slots in the nuts at the same time; several ball joint lathes of compact design, being used to make and grind the ball joints for the connection between cars; a dozen or more of brass lathes, made at the works, and of capacity suited to the work to be done, and many small tools and cutters in the tool room that show a familiarity with the work to be done and an appreciation of the value of small things by the shop management. Among these small tools are quite a number of novelties, such as a series of cutters of irregular shapes, all fitting the same chuck and marked with letters to indicate the chuck to which they belong. These cutters are designed to complete with one operation all of one side of a piece of brass work in a lathe, then by changing a cutter a new one is substituted and the other sides are finished. Some of the cutters have five working edges. For reaming work, in a lathe or drill press, a reamer with curved flutes is used, the curves of the flutes acting to make the reamer back out of the work rather than to draw into it, with the effect of reducing all tendency to "bite."

One of the novelties that is well worthy of description is a boring bar that bores out at one setting and at one cut a hole that has not a circular section, but is, instead, composed of three circles, each of different radius. The device and its operation are as follows: A boring bar carries a supplemental bar that holds the cutting tool, and is hinged to the central bar at one end, the other end being free to move to and fro from the centre as desired, the movement being steadied by a powerful spring and governed by a cam which is attached firmly to the tail-stock spindle. On this cam a roller on the supplemental bar is pressed by the spring just mentioned, and as the cam has a contour concentric with but of smaller dimensions than the desired contour of section of the hole to be bored, it is clear that the supplemental bar, and therefore the tool, will move in the desired path to bore out the required cavity. This tool was devised to finish the cylinders of a rotary pump that is being made at the works.

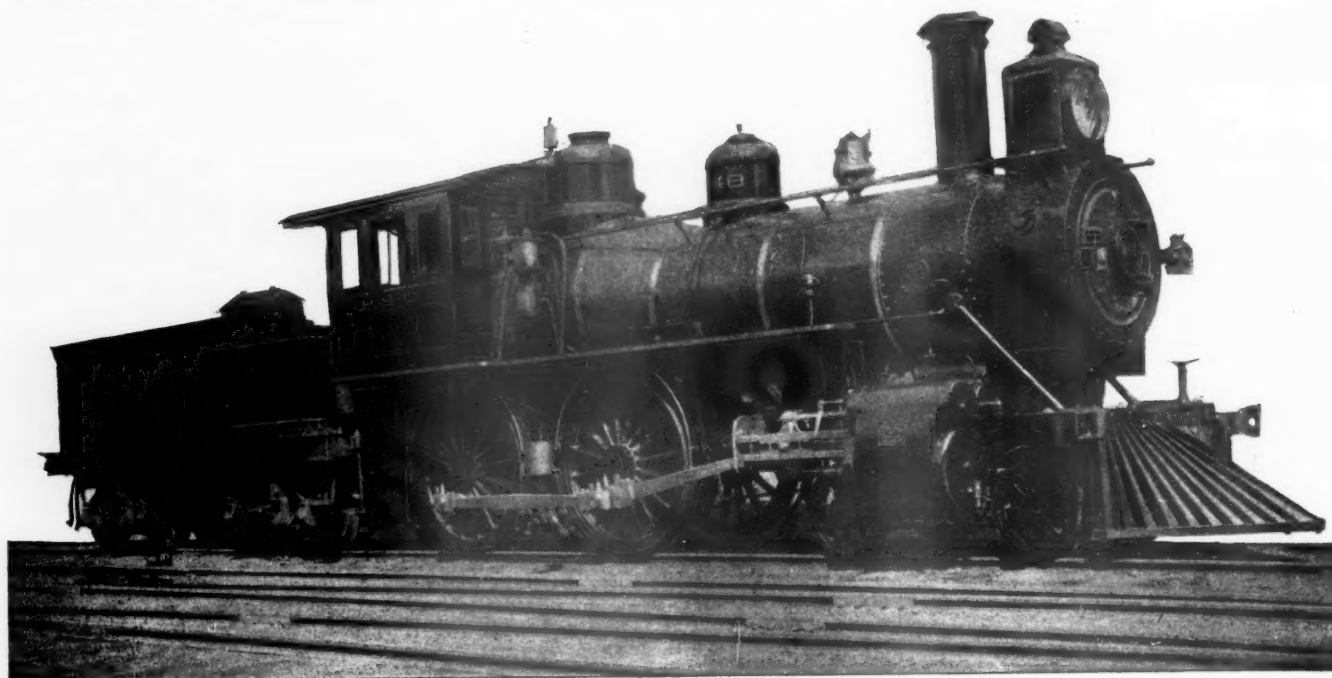
There are now building here a number of safety car heaters to use with a fire on the hot-water systems. This heater is made entirely of wrought iron, and so arranged that coals cannot drop out when the heater is overturned. It can be used either with a fire or with steam.

A new coupling has been recently brought out for hose or pipe connections. It has wide bearing seats, is automatic in uncoupling and has butt joints. In connection with this will be used a new automatic drip valve that will drain the hose when the car is standing without pressure of steam thereon.

In a small engine room, near the main engine, is a high-speed engine for dynamo and general work designed by the superintendent and built at the works. It is a 19 H. P. machine and occupies but 24 in. x 28 in. of floor space, and is one of the most compact engines built with a double-acting cylinder. It has a sensitive governor and runs steadily at 450 revolutions. One of its peculiarities is a return connecting rod, the wrist pin being at one side of the centre line of the cylinder.

In connection with the manufacture of railroad car steam-heating apparatus the company also makes a line of superior and high grade brass fittings for all classes of steam work. The fittings are all nickel-plated, and have a high finish. Recently the company has obtained control of the Barclay lubricator for steam engines. It is also making a cash register, and is doing a regular line of light work, the brass and iron castings for which are of most excellent material and cleanly made, most of the work in the brass foundry being "plate" work.

Eighty men are employed, and the force will be increased as soon as more room can be obtained, which will be when the new pattern shop is completed, the foundations for which are already laid.



THE BALDWIN FOUR-CYLINDER COMPOUND LOCOMOTIVE.

#### Four-Cylinder Compound by the Baldwin Locomotive Works.

We show in this issue in much detail the four-cylinder compound eight-wheel locomotives built by the Baldwin Locomotive Works, under their patents Nos. 406,011 and 406,012, for the Baltimore & Ohio Railroad. These illustrations and the dimensions are taken from drawings furnished by the builders, and contain the first complete and authentic description of this interesting engine. The drawings have been withheld from publication for some time, awaiting the results of actual service after this novel type of machine had been adjusted to operate as intended by the designers.

The main features of the body of the locomotive, with the exception of the cylinders, are not unlike the ordinary type of eight-wheeler, and they are so well shown by the perspective from a photograph and the diagram of the engine and tender, fig. 1, to require no further attention than the mention of the leading dimensions, which are as follows:

Diameter of high-pressure cylinder.....	12 in.
low .....	20 "
Ratio of volume of the high to that of the low pressure cylinder.....	1 to 2.77
Stroke of pistons.....	24 in.
Diameter of boiler.....	58 "
Length of grate.....	108 "
Width of .....	34 "
Depth of firebox at front end, inside.....	63 1/4 "
back .....	48 1/4 "
Number of tubes.....	251
Length .....	11 ft. 10 in.
Diameter .....	2 "
Weight on drivers—working order.....	75,515 lbs.
truck — .....	33,965 "
Total weight.....	109,480 "
Diameter of drivers.....	66 in.
Spread of driver.....	7 ft. 6 in.
Height of centre of boiler above top of rail.....	7 ft. 1 1/4 in.
Tank capacity.....	3,500 galls., U. S.
Outside lap of valve H. P. cylinder.....	3/4 in.
L. P. .....	1 1/2 "
Inside clearance of valve H. P. cylinder.....	1/8 "
lap of valve L. P. .....	1/8 "

Probably the most striking feature of this engine is the location of the cylinders, which are placed above and below the centre line of the crosshead—the high pressure above the low—both working on the same crosshead, and connected to the wheel by one main rod placed midway between the centre lines vertically. Such an arrangement as this, with the centre line of the connecting rod offset from the centre of the cylinders, is seldom seen even in the smallest sizes of steam engines, and is not in favor among engineers because of the twisting strain on the crosshead in the case of the single cylinder steam engines, and in double engines when the pressures are not equal at all times; however, there are some few small stationary engine built in this way which do work satisfactorily at high and low speeds. This cylinder arrangement is clearly shown in figs. 2 to 7 and fig. 9. From these it will be seen that the cylinders are placed above each other on the same vertical line, the high pressure being above the low, with only the thickness of a wall of cast iron, 1 1/2 in., between them. The arrangement of the stuffing boxes and heads and a longitudinal section of the cylinder are shown in fig. 3. The location of the back and front heads and the method of securing the same are shown in fig. 4, which shows also how the heads had to be cut off when they came together, and a stud used at the joint to hold both heads at the same time. In this figure also is seen the rectangular projection on the back head made to take the cylinder head casings.

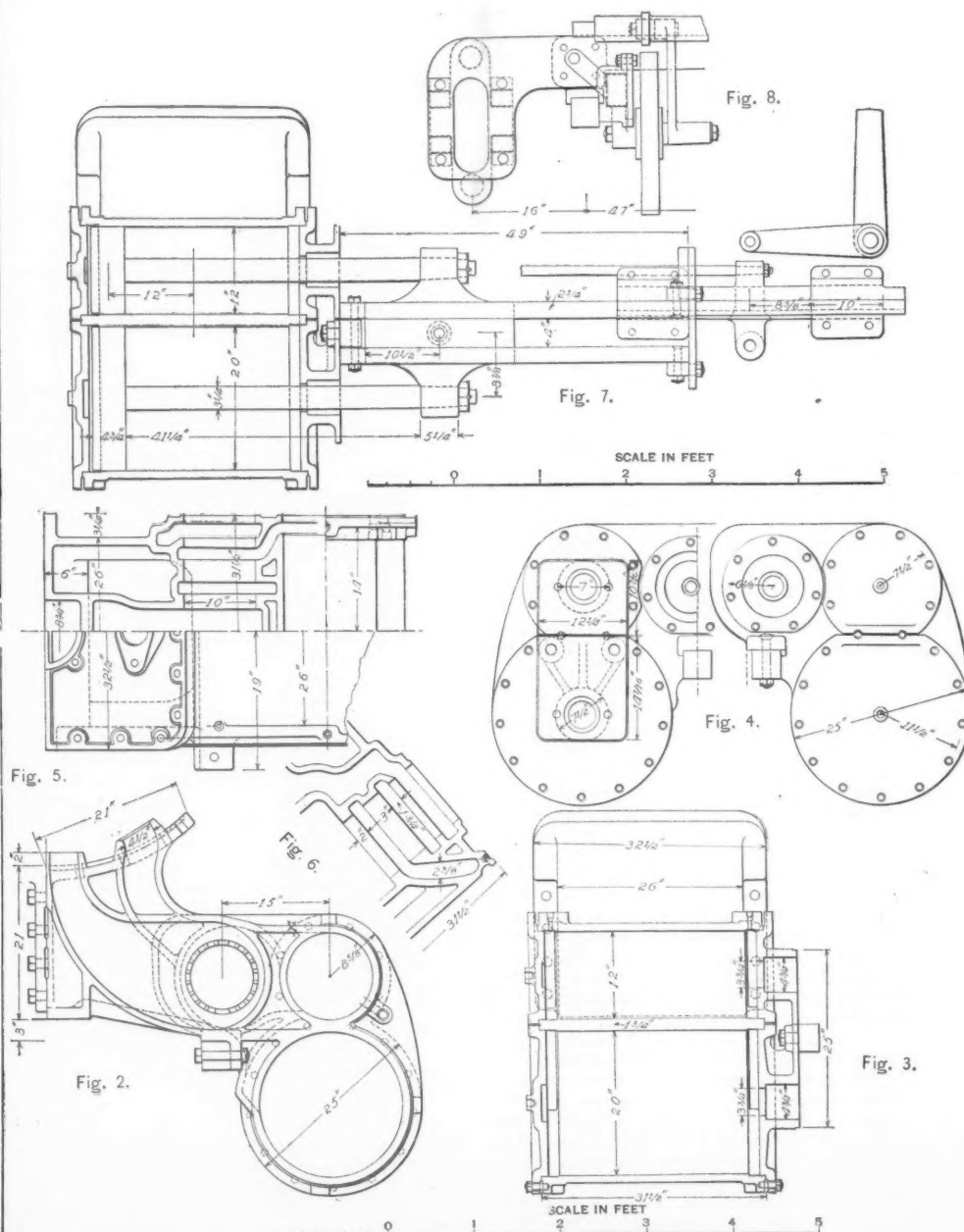
The next most interesting feature of this design is the multiple ported piston valve shown in figs. 10 to 13. This valve will be seen to consist of four separate pistons having two packing rings each, a detail of the

joints of which is given in fig. 13. This valve works in a bushing containing a series of ports shown in figs. 14 and 15, and is made tight therein by means of the eight packing rings, these rings being sprung into grooves in the pistons as shown.

The complicated-looking sets of port holes in the bushing are really simple in function. They are used in complete sets and are not made into one large port, because

it is desirable to keep the bushing all in one piece, and if they were all together in one opening the bushing would be divided into four parts. It will be noticed that there are passages in the cylinder saddle which correspond with the openings in the bushing. These are shown in figs. 5 and 6.

The location of the piston valve with reference to the cylinder is given in figs. 2, 4 and 5. It is inside of and



BALDWIN FOUR-CYLINDER COMPOUND LOCOMOTIVE.



at about the same height as the high-pressure cylinder. To it lead the necessary ports to convey steam to and from the cylinders. These ports are clearly seen in figs. 2, 5 and 6. The precise attachment of the two piston rods to the single crosshead is indicated in fig. 7, where it will be noticed that the distance between the centres of the cylinders is 17½ in., the distance of the centre line of each cylinder from the centre of the crosshead being 8¾ in.

One of the striking departures from common practice is the method of driving the valve shown in figs. 7 and 8. It will be seen that the link block of the usual Stephenson link motion is attached to a sliding bar instead of a rocker, as in the ordinary arrangement. By the link this bar, instead of the common rocker, is driven to and fro. This motion is imparted to the valve rod by means of a fixed arm on the sliding bar, to which is rigidly attached the valve rod, as shown in fig. 7.

The construction of the valve and the bushing in which it slides is readily understood from the drawings; they are simple in form. The operation of the valve and its passages in service is as follows: Steam is admitted to the regular steam pipe as usual in the ordinary form of the locomotive. Through these passages it reaches the piston valve at the ends. Live steam at boiler pressure is always on both ends of this valve; therefore it is balanced. Steam being upon each end of the piston valve, it passes into the high-pressure cylinder through the ports in the end of that cylinder, and the second series of ports in the bushing—shown in figs. 5 and 14—as soon as the valve is moved in either direction. When the valve is moved far enough to cause either of the two large openings in the body of the valve—one at each end—to come opposite to the second series of ports in the bushing (reckoning from the right-hand side of the bushing as shown), then steam passes from the high-pressure cylinder into the valve and through it to the opposite end of the valve, out of which it then passes through the other hole in the valve, which is at this time—owing to the proper distribution of the ports—opposite to the steam ports for the low-pressure cylinder, which are coincident with the third series of ports in the bushing. Now, as the valve continues to move, this last port will close, the packing rings will pass over it and the annular cavity around the piston valve caused by its small diameter at the centre will be opened to the third series of ports in the bushing, and therefore to the low-pressure cylinder. Hence the steam therein will exhaust into the cavity around the valve, and therefore into the big exhaust port shown in fig. 5, and through the fourth series of ports in the bushing, which are shown on the extreme left of fig. 14. It must be remembered in looking at fig. 14 that it shows only one-half of the whole bushing; the whole bushing containing just twice the number of series of ports that are shown. There is no complication in the action of this valve. It controls steam admission and exhaust in precisely the same manner as the common slide valve, and the lap and lead are to be spoken of in the same way.

There is still another device that has not been described and which performs an important function. It is the starting valve shown in fig. 9. By means of it, when steam is admitted into one end of the high-pressure cylinder, steam is wire drawn to the other end also, from which it passes through the exhaust ports and passages of the high-pressure cylinder and piston valve to the low pressure, and an increased power at starting is obtained. This starting valve is operated from the cab.

It is doubtful if further description of these details of construction are necessary, as a particularly clear set of drawings is given herewith; but before passing to a description of the unusually interesting indicator cards, which were taken from the engine while operating on the Baltimore & Ohio road, it might be well to concisely state what are the claims of the builders for advantage with this type of engine. From a description prepared by them we quote the following:

"The engine has been designed to meet the demand for a simple method of compounding the present American engine, to realize the maximum economy at the least expenditure and to provide a method of construction applicable to all existing types of American locomotives.

"An inspection of the indicator diagrams will show that the steam is used with great economy. The extreme shortness of the steam passages, together with ample exhaust passages, preclude the possibility of the results shown by any other method than direct expansion, absence of an intermediate receiver and the use of the piston valve.

"Any combination can be made that may be desired in the valve, it being composed of two ordinary slide valves, one within the other, as it were, attached to a common valve rod. The simplicity of this arrangement and the absence of the usual rock shaft make this portion of the compound less expensive than the same mechanism used on the ordinary locomotive, and far more durable.

"The arrangement of guides and cross-heads calls for an increased outlay, viz: the cost of two more pistons and their fittings. These are small and comparatively inexpensive. The stuffing boxes, being fitted with metallic packings, are not serious matters of cost or maintenance. The casting comprising the cylinder, steam chest and half saddle is of about the same weight as that used on the ordinary locomotive, the exact weight on the truck of the engine herewith shown being but 25 pounds more than the ordinary loco-

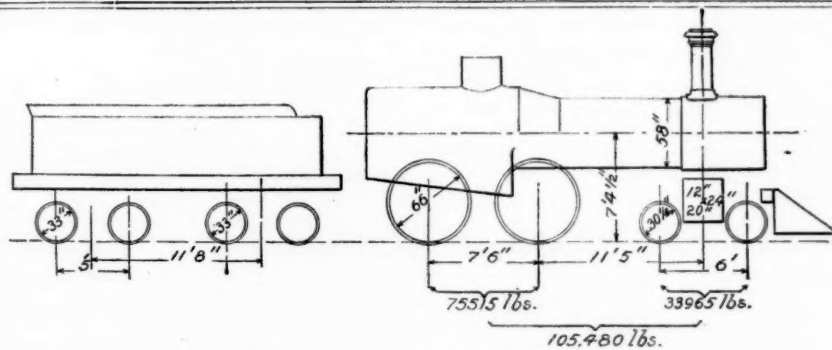


Fig. 1—Diagram of General Dimensions and Weights.

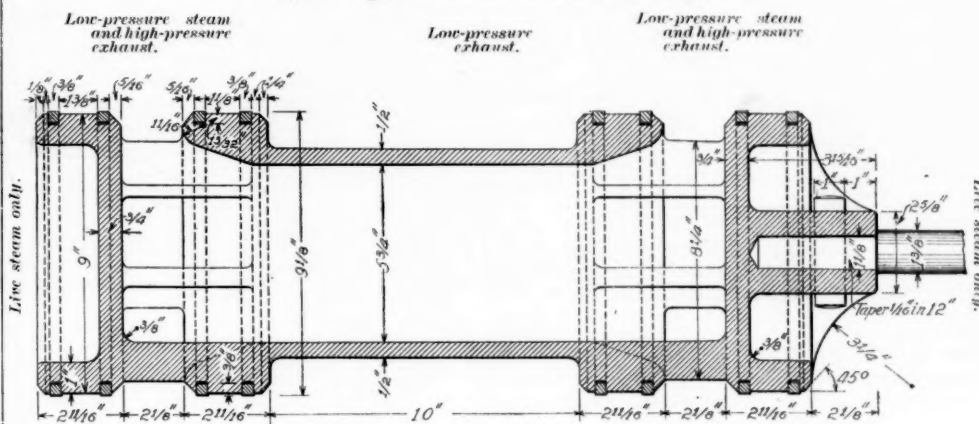


Fig. 10.

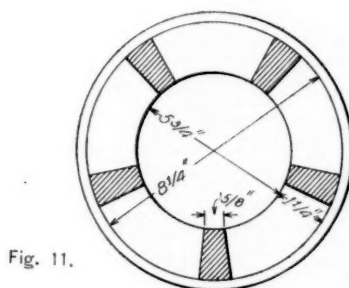


Fig. 11.

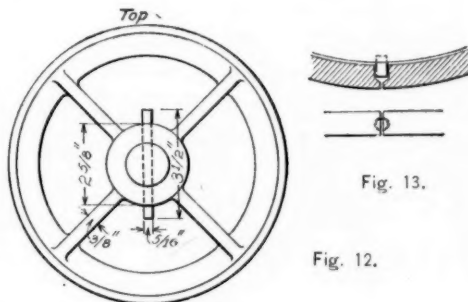


Fig. 12.

Fig. 13.

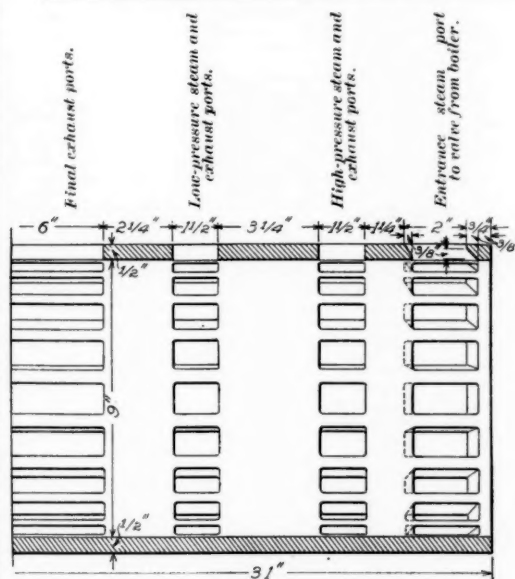
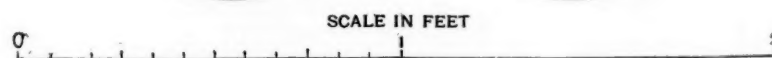


Fig. 14.

BALDWIN FOUR-CYLINDER COMPOUND LOCOMOTIVE.

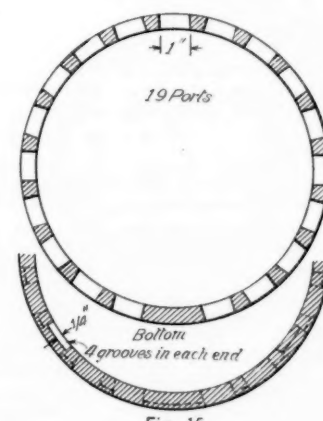


Fig. 15.

motive, and in every other way is its counterpart. This is phenomenal and may vary one way or the other several pounds, depending on various minor details. In the connection of two pistons to a common crosshead the most satisfactory results have ensued. The guide bars and guide bearer are very light, and no heating, cutting or bending has been noticeable in some 20,000 miles of service. A spoonful of oil is sufficient to lubricate them during a run of 100 miles. All other parts are similar to those of an ordinary locomotive of the same class, not compounded.

"The facility with which the engine starts depends upon the admission of steam to the low-pressure cylinder, which is readily accomplished by coupling the two ends of the high pressure cylinder and wire drawing into the low-pressure cylinder. A pressure can thus be obtained sufficient to start the heaviest trains, utilizing the entire

adhesion of the engine without undue strain on the piston rods.

"Water caused by condensation in cylinders, the enemy of compound engines in general, is felt to a very slight extent only, so much so that no cylinder cocks are required for the high-pressure cylinders, and one or two strokes clears the low-pressure cylinders entirely. Relief valves are provided on the low-pressure cylinders to prevent damage in case a careless engineer should get the boiler too full of water and work it over into the cylinders.

"Heavy freight trains, as well as fast express trains, have been hauled with equal success. A piston speed of 1,500 ft. per minute has been attained in express service.

"As this locomotive has been developed and improved during the past six months, the Baldwin Locomotive

Works are now in a position to proceed with accurate tests. Comparisons will be made between the compound and the ordinary locomotives of the same class, built from the same drawings in all other respects. The economy in actual practice is so apparent with the locomotive that an economy of at least 25 per cent. of fuel is expected, and little or no more repairs while engine is in service than would be required by an ordinary locomotive."

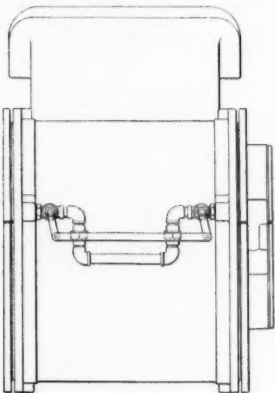


Fig. 9.

Those who are interested in this locomotive ought to study carefully the indicator diagrams, from both cylinders under varying conditions, which are given herewith, together with considerable information relative thereto, which will be found in the following table :

INDICATOR DIAGRAMS OF BALDWIN COMPOUND LOCOMOTIVE.

Card No.	Revolutions per minute.	Miles per hour.	Cut-off H. P. cylinder.	M. E. P. H. P. cylinder.	M. E. P. L. P. cylinder.	Horse power developed.	Remarks.
1	...	...	...	...	...	...	Cards Nos. 1, 2, 3, 4 are the ideal cards from which engine was designed. H. P. cyl. 12" d.a. L. P. cyl. 20" dia.
2	...	...	...	...	...	...	Starting heavy train.
3	...	...	...	...	...	...	Train of 29 cars—freight.
4	...	...	...	...	...	...	Steam—100 lbs. pressure.
5	...	...	...	...	...	...	Throttled.
6	...	...	...	...	...	...	Steam—150 lbs. pressure.
7	...	...	...	...	...	...	Throttled.
8	...	...	...	...	...	...	Throttled.
9	...	...	...	...	...	...	Throttled.
10	...	...	...	...	...	...	Throttled.
11	...	...	...	...	...	...	Throttled.
12	...	...	...	...	...	...	Throttled.
13	...	...	...	...	...	...	Taken to show how the valve was divided and set.
14	...	...	...	...	...	...	These cards were taken from front ends of both cylinders to show simultaneous pressures on both pistons.
15	...	...	...	...	...	...	These are the reverse of the preceding and show the continuous expansion.
16	...	...	...	...	...	...	Sample cards at short cut-offs.
17	...	...	...	...	...	...	
18	...	...	...	...	...	...	
19	...	...	...	...	...	...	
20	...	...	...	...	...	...	
21	...	...	...	...	...	...	
22	...	...	...	...	...	...	
23	...	...	...	...	...	...	
24	...	...	...	...	...	...	

Further remarks upon this locomotive and its peculiarities will be found in the editorial columns.

#### Uniform Bills of Lading.

As noted in our last issue, the chairman of the joint committee of the Trunk lines and the Central Traffic Association has announced the adoption of the uniform bill of lading which has been under discussion several months. He says that, after a careful consideration of the votes and the views accompanying the same, the ballot upon the subrogation clause is so evenly divided that it has been decided to leave its use discretionary with the initial lines. When the subrogation clause is used it should be inserted at the end of Condition 3, as marked in the bill of lading in the following words:

Any carrier or party liable on account of loss or damage to any of said property shall have the full benefit of any insurance that may have been effected upon or on account of said property.

It has also been decided that the following rule be printed in the official classifications and on tariffs:

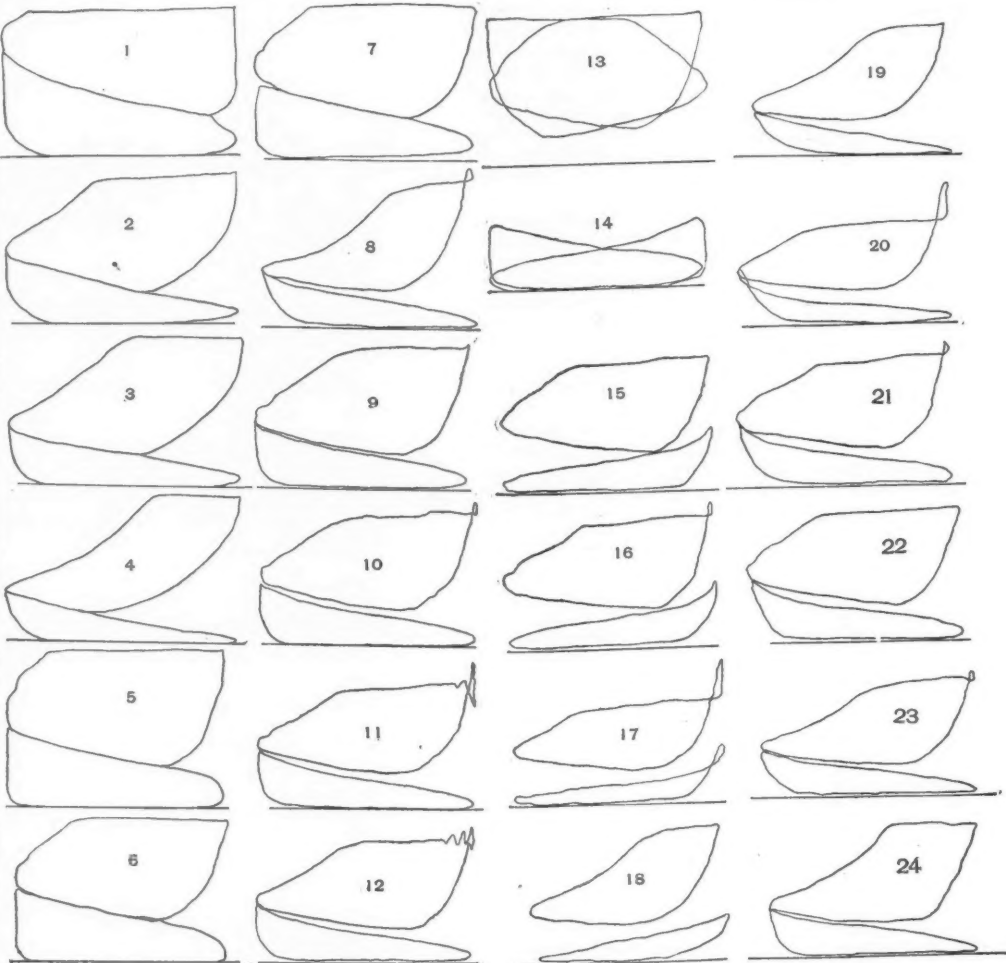
When property is tendered for shipment and shippers elect not to accept the uniform bill of lading therefor, such property shall be forwarded at the common carrier's liability, in consideration for which the charge shall be one class rate higher than that named in the regular published tariffs and classification therefor.

The following is the form of contract:

The property described below in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said company agrees to carry to the said destination if on its road, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, in consideration of the rate of freight herein named, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property that every service to be performed hereunder shall be subject to all the conditions, whether printed or written, contained in such bill of lading and which was hereby agreed to by the shipper, and by him accepted for himself and his assigns as just and reasonable.

Upon all the conditions, whether printed or written, herein contained, it is mutually agreed that the rate of

\* "Not Negotiable" is printed across the face of the bill.



IDEAL AND ACTUAL INDICATOR DIAGRAMS, BALDWIN COMPOUND LOCOMOTIVE.

freight from..... to..... is to be, in cents per 100 lbs.: If first class.....; If second class.....; [and so on]. Advanced charges at .....

#### CONDITIONS.

1. No carrier or party in possession of all or any of the property herein described shall be liable for any loss thereof or damage thereto by causes beyond its control; or by floods or by fire from any cause or wheresoever occurring, or by riots, strikes or stoppage of labor, or by leakage, breakage, chafing, loss in weight, changes in weather, heat, frost, wet, or decay, or from any cause if it be necessary or is usual to carry such property upon open cars.

2. No carrier is bound to carry said property by any particular train or vessel, or in time for any particular market, or otherwise than with as reasonable dispatch as its general business will permit. Every carrier shall have the right, in case of necessity, to forward said property by any railroad or route between the point of shipment and the point to which the rate is given.

3. No carrier shall be liable for loss or damage not occurring on its own road or its portion of the through route, nor after said property is ready for delivery to the next carrier or to consignee. The amount of any loss or damage for which any carrier becomes liable shall be computed at the value of the property at the place and time of shipment under this bill of lading, unless a lower value has been agreed upon or is determined by the classification upon which the rate is based, in either of which events such lower value shall be the maximum price to govern such computation. Claims for loss or damage must be made in writing to the agent at point of delivery promptly after arrival of the property, and if delayed for more than 30 days after the delivery of the property, or after due time for the delivery thereof, no carrier hereunder shall be liable in any event.

4. All property shall be subject to necessary co-operation and baling at owner's cost. Each carrier over whose route cotton is to be carried hereunder shall have the privilege, at its own cost, of compressing the same for greater convenience in handling and forwarding, and shall not be held responsible for unavoidable delays in procuring such compression. Grain in bulk consigned to a point where there is an elevator may (unless otherwise expressly noted herein, and then if it is not promptly unloaded) be there delivered, and placed with other grain of same kind, without respect to ownership, and if so delivered shall be subject to a lien for elevator charges in addition to all other charges hereunder. No carrier shall be liable for differences in weights or for shrinkage of any grain or seed carried in bulk.

5. Property not removed by the person or party entitled to receive it within 24 hours after its arrival at destination may be kept in the car, depot or place of delivery of the carrier, at the sole risk of the owner of said property, or may be, at the option of the carrier, removed and otherwise stored at the owner's risk and cost, and there held subject to lien for all freight and other charges. The delivering carrier may make a reasonable charge per day for the detention of any car and for use of track after the car has been held 48 hours for unloading, and may add such charge to all other charges hereunder, and hold said property subject to a lien therefor. Property destined to or taken from a station at which there is no regularly appointed agent shall be entirely at risk of owner when unloaded from cars, or until loaded into cars; and when received from or delivered on private or other sidings shall be at owner's risk until the cars are attached to, and after they are detached from, trains.

6. No carrier hereunder will carry, or be liable in any way for any documents, specie, or for any article of extraordinary value not specifically rated in the published classifications, unless a special agreement to do so, and a stipulated value of the articles are endorsed hereon.

7. Every party, whether principal or agent, shipping inflammable, explosive, or dangerous goods, without previous full written disclosure to the carrier of their nature, shall be liable for all loss or damage caused thereby, and such goods may be warehoused at owner's risk and expense, or destroyed without compensation.

8. Any alteration, addition, or erasure in this bill of lading which shall be made without the special notation hereon of the agent of the carrier issuing this bill of lading shall be void.

9. If the word "order" is written hereon immediately before or after the name of the party to whose order the property is consigned, without any condition or limitation other than the name of a party to be notified of the arrival of the property, the surrender of this bill of lading properly endorsed shall be required before the delivery of the property at destination. If any other than the aforesaid form of consignment is used herein, the said property may, at the option of the carrier, be delivered without requiring the production or surrender of this bill of lading.

10. Owner or consignee shall pay freight at the rate below stated, and all other charges accruing on said property, before delivery, and according to weights as ascertained by any carrier hereunder; and if upon inspection it is ascertained that the articles shipped are not those described in this bill of lading, the freight charges must be paid upon the articles actually shipped, and at the rates and under the rules provided for by published classifications.

11. If all or any part of said property is carried by water over any part of said route, such water carriage shall be performed subject to the conditions, whether printed or written, contained in this bill of lading, including the condition that no carrier or party shall be liable for any loss or damage resulting from the perils of the lakes, sea, or other waters, or from explosion, bursting of boilers, breakage of shafts, or any latent defect in hull, machinery or appurtenances, or from collision, stranding, or other accidents of navigation, or from the prolongation of the voyage. And any vessel carrying any or all of the property herein described shall have liberty to call at intermediate ports, to tow and be towed, and to assist vessels in distress, and to deviate for the purpose of saving life or property. And any carrier by water liable on account of loss or damage to any of said property shall have the full benefit of any insurance that may have been effected upon or on account of said property.

#### New Car Heating Devices—Consolidated Car Heating Co.

During the past winter the Consolidated Car Heating Company has made several important improvements in the construction of its devices. One of the most important is a change in the size of the hot water drum in connection with Baker heating systems. The new drum is shown in fig. 1. It is 10 in. in diameter and 33 in. long. It has two openings for pipes at one end, as shown in fig. 2. The hot water rising from the Baker heater or from the heating coils of the steam drum, passes into one of these openings, as at A, lengthwise of the drum on one side of the diaphragm B, which is 5 in. high and 27 in. long, then back on the other side of the

\* [When subrogation clause is used insert it here.]



diaphragm out of the other opening, for instance, as at C.

One of the novelties of this device is the method of arranging the over-flow pipe in such a way that the movement of the water in the drum does not cause it to run out of the over-flow to a greater extent than is desired. Fig. 3 shows this arrangement. It consists of a small casting with three openings, which is screwed on to the top of the over-flow pipe D, as shown. Above D is a cavity E which connects by a small lateral opening C with a vertical passage opened at both ends A and B. This device is located within the drum, and the water therein may be considerably agitated without causing an excessive over-flow through C.

Another of the successful devices, particularly on the direct steam system, is the drain cock, which is used instead of a trap. It is shown in figs. 4, 5, 6 and 7. It consists of a cylindrical plug valve which is rotated freely by the handle B. It has two open and two shut positions, as indicated by the short pointer on the end of the handle, and the lettering on the plate above the valve, as shown in fig. 4. It is placed in the train pipe in some convenient position, the pipe being tapped in at the ends at A A. This valve is asbestos packed, as shown clearly in figs. 6 and 7, to prevent injury from freezing.

The principal novelty of this drain valve is in the adjustable opening through which passes all the condensa-

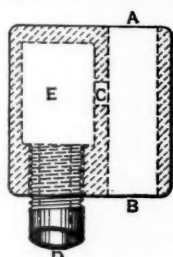


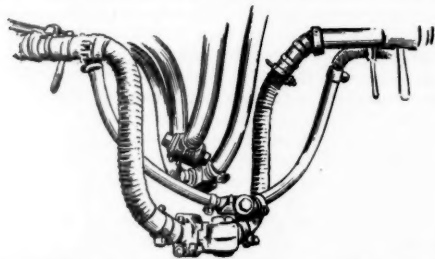
Fig. 3.

tion of the steam heating system, the opening being adjusted to suit various conditions. This is accomplished by placing in the centre of the valve stem a spindle which closes the small opening through the valve, and which is adjusted by a screw on the end of the spindle and a check nut, as shown in fig. 7. The object of the two open and shut positions now becomes apparent. If dirt lodges on one side of the valve, and the condensation fails to pass outward, then the reversal of the handle to the other open position reverses the direction of the condensed water through the plug and blows out all sediment, and the valve is free to operate. These devices have operated this winter with satisfactory results.

#### Position of Steam-Heating Couplings.

To illustrate what we have said recently on the question of the proper position of steam couplings, we show an illustration taken from a photograph of the couplings between the cars on a Pennsylvania "limited" train. Four couplings are shown. One for the air brake, one for the conductor's signal, one for air used to drive water from the tanks under the cars to the wash basin, and the lowest of all the steam-heating hose. At the time this photograph was taken the hose fittings to the steam pipe were leaking. The coupler itself was tight. The water was running down the hose and dripping off at the bottom of the sag.

Here is a train that is cared for in the best practicable manner. Every detail is carefully watched, yet the steam-heating connection may be found to be leaking either at the coupling or at the joint between the hose and the train pipe. From this one might conclude that, no matter what coupling or connection be used in joining the hose together or to the steam pipes, sooner or later they will leak more or less, and when they do the relative position of the couplings, if the steam coupling be above the others, is such as to make trouble in freezing weather. The return system of steam heating adds yet another coupling, but it is generally placed at some distance from the centre line, on either side; but if it were not, there would be a double chance of leakage of condensation upon this collection of hose connections, except it be with the vacuum systems, with which



there would generally be a vacuum in one pipe. However, as double connections are usually widely separated, there is little danger of condensation reaching the hose of other connections.

During the last cold snap we received several reports of ice forming on the air-brake connections. In one in-

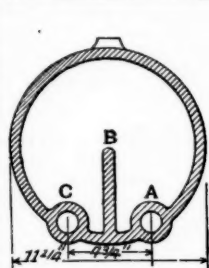


Fig. 2.

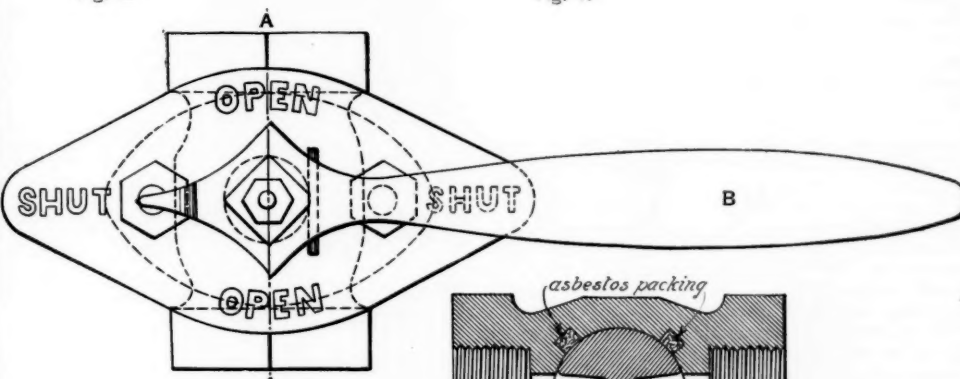


Fig. 1.

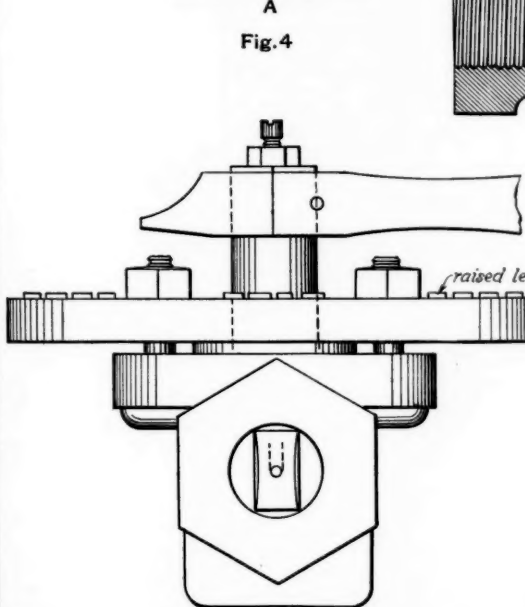


Fig. 4.

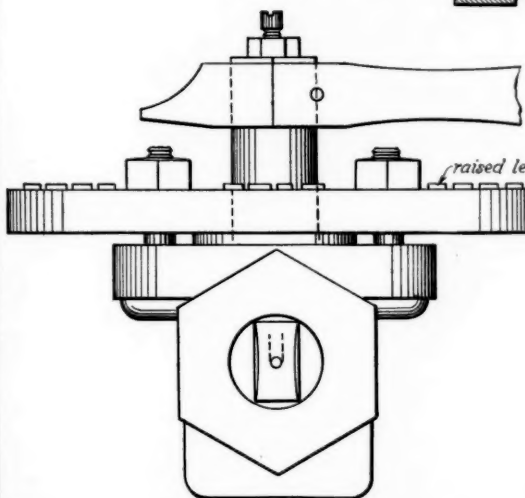


Fig. 5.

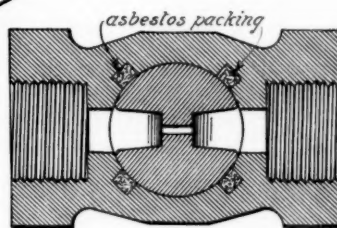


Fig. 6.

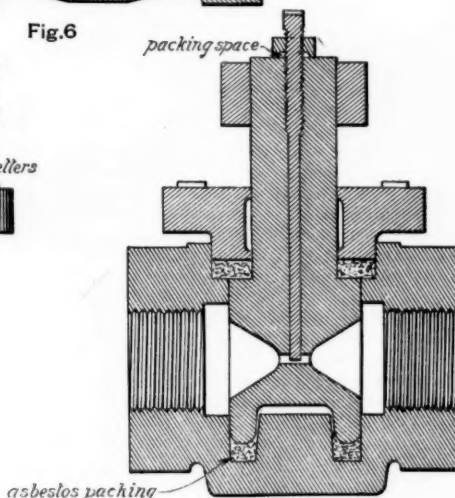


Fig. 7.

#### RECENT DEVICES OF THE CONSOLIDATED CAR HEATING COMPANY.

stance, a curious traveler watched the collection growing on the air-brake coupling, and when it had amounted to a considerable thickness, sufficient to prevent the couplings from pulling apart, he was curious to see how the trainmen would disconnect the car at terminal stations. Upon arrival, apparently by force of habit, the trainman grabbed a coupling pin before he looked at the air-brake hose at all, and with this he commenced to beat the ice off the connection. Such reports as these, of which there are a number, go to show that steam couplings placed above the air-brake hose have caused collections of ice to form thereon in numerous cases this past season, and in some cases to a dangerous extent.

Since publishing a few weeks ago a number of opinions on the position of steam-heating couplings we have received the following:

R. G. Chase, General Manager, Williams Car Heating Co.: It has always been held to be one of the advantages of a "return" system that, by using two lines of pipe, it allows the steam couplings to be placed up at the sides of the drawbar, where they are out of any possible interference with the brake couplings. This position also enables us to carry lower steam pressure by reducing the "pocket" and friction at the couplings. I have no doubt that this is the best possible position; but if a single line of pipe is to be used, the experience of the Lake Shore accident would indicate that the steam coupling should be placed below the air brake coupling.

#### Locomotive Building in New South Wales.

The government of New South Wales have taken a most important step toward the solution of the difficulties which have beset the many proposals for the successful fostering of the locomotive building industry in New South Wales. We are officially informed that "a contract has been made between Sir Saul Samuel, the Agent-General for the government of New South Wales in London (acting on behalf of his government), and a syndicate in this country for the establishment in that colony of locomotive works upon an extensive scale, as recently advertised for by the New South Wales Commissioners." Hitherto the government have not succeeded

in their desire to foster native industry. Contracts have been given out to colonial firms at prices very considerably in excess of those asked by firms at home, and yet the work has not been found profitable. Besides, the time taken has very largely exceeded that stipulated in the contract, which was often double the time within which similar work could be done in establishments at home.

A syndicate of gentlemen interested in the colony, one of whom resides in New South Wales, has been formed, and is to be named the Australasian Locomotive Engineering Co., which would indicate that the field is not to be confined to one district. They have booked a contract for 100 locomotives and tenders to start with and have the promise of more. As managing director they have secured the services of Mr. Dugald Drummond, locomotive superintendent of the Caledonian Railway Co., and one of the foremost men in the profession. He has designed some of our finest engines, bogie carriages and other rolling plant. He is now organizing a staff, and will shortly send to the colonies three of the men who are to take principal positions on that staff, to ascertain the conditions of the country and to fix upon a site which will be most convenient for the railways, and at the same time be close by the coalfields. The plant for the new works will probably all be arranged for in this country, but as the scheme is only in its initial stage it is impossible to enter into details. The most modern machines will be employed. The engineers of this country, however patriotic they may be in wishing well to the young colony, must view with certain apprehension the new scheme. It is true that for a time the unmanufactured material, castings, etc., must be sent from this country, but the idea is to make as much as possible in the colonies, and foundries and the other necessary adjuncts to large locomotive works will be established by the new company with as much dispatch as possible. Colonial labor, too, is to be employed extensively.—*Engineering*.

#### A Direct Route from India to Burmah.

The distance from Calcutta to Mandalay by the Makum-Mogong route, when the Assam and Mu Valley railways are open, will be about 1,120 miles, without allowing for the twistings which a passage over two ranges will necessarily involve. Probably the actual distance to be traversed will be about 1,400 miles. The distance from Calcutta to Mandalay by Chittagong, similarly reckoned, is about 430 miles, or allowing for indirectness of route in the same proportion, about 540 miles will have to be traversed.—*Indian Engineering*.

## Long Span Bridges.

We have collected below a list, which we believe to be pretty accurate, of existing bridges of long span. The term long span, as applied to bridges, necessarily changes with the times. Mr. T. C. Clarke, in 1877, gave a list of the long span bridges of that day, containing 33 bridges. His reference point, however, was a span of 300 ft., and his list contains only eight bridges of 400 ft. span or over. We have moved the reference point up 100 ft. to spans of 400 ft.

To include all spans above 300 ft. would have made a very long table, as there are over 50 railroad bridges in the United States alone exceeding 300 ft. that are omitted from our list. We have even omitted some which have heretofore been called 400 ft. spans, because they are a few inches inside of our assumed limit, for example, the Louisville bridge. In order to compare all kinds of bridges, it was necessary to determine the proper span to be used, viz., clear span, span between bearing points, or length over all. The span between bearing points has been assumed, and we have endeavored, as far as the records accessible will permit, to refer all our bridges to this length of span. We have given the spans in the nearest foot as sufficiently close for the purpose.

Bridges now under construction are not included, as, for example, the Memphis bridge with 790-ft. span, the Needles bridge with 660-ft. span and the Ohio Connecting bridge with 523-ft. span.

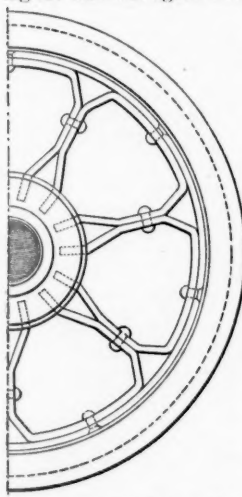
The drawbridge spans are the length of the swing spans, between centres of rest pins.

Doubtless our readers will find in the table errors of omission as well as of commission, and we hope that they will send any corrections that they may be able to make. If there are many such we shall republish the table.

## Machine Shops in France.

The erecting shops of the Northern Railroad of France are situated a mile from the main depot in Paris and cover a large extent of ground. No pretence is made that they are model shops, for they were built many years since, and have been slowly added to or altered. Here are prepared all plans and specifications for their more complete works at Hellemmes, near Lille, where the newest forms of machines are installed.

The drawing offices are the first buildings reached on entering, 22 employés being engaged on locomotive details alone, while a greater number are at work on cars and appliances in another part. Entering the wheel-casting shops and continuing on to the forges and adjacent steam hammers, little is noticeable that is not well known at home. They have a very economical plan of making wheels for cars by bending up 7 pieces of bar iron in such a shape that the centre fits inside of a band or false fellow, which, in turn, is hammered into a groove in the tire. Fellow and bar are riveted together and the bars bent round to the centre of the wheel, and their ends then have a mold placed below and above them; cast iron is then run in, forming the hub—see figure herewith—which is afterwards



bored out and the cast steel axle forced in by 55,000 to 60,000 lbs. hydraulic pressure. The life of the centre of the wheel is said to be practically interminable under ordinary conditions, and the cheapness is such that they are now adopted almost entirely. However, in some cases wrought bands will be seen to have been shrunk on the hubs of some that have been cracked by wreck or other cause; but the greatest care is taken to reject any with sand cracks or other defects. Further along are the punching, shearing and slotting machines for working the plate frames of locomotives, and, lower

still, the spring shop, with sample machines for cutting, tempering, testing, etc. Out of 11,500 locomotive springs in service 21 per cent. are repaired or replaced in the course of a year, and 23½ per cent. of tender springs; locomotives running 11,250 miles to every spring replaced and tenders 18,170 miles for each spring.

Among the piles of new tubes we notice a very large proportion are of steel, which are gradually replacing brass; the water in North France being tolerably pure. Nearly 1,500 locomotives have brass tubes with copper ferrules, 76 locomotives at present with steel entirely, 43 entire brass, and 116 with iron tubes with copper ferrules. Fire boxes are wholly of copper, and the company replaces between 15 and 20 boxes per year, which generally run from 300,000 to 320,000 miles before being removed.

The machine shop is well-stocked with lathes, drills, planers, milling machines, shapers, wheel borers, slot-

ters, etc., of types that are familiar to those who visited the Paris Exhibition. These are driven principally by a

TABLE OF LONG SPAN BRIDGES.

## 1.—Cantilever Bridges.

NAME.	Country.	Purpose.	Spans.
Forth.....	Scotland.....	Double track railroad.....	{ Two, 1,710 ft. Two, 690 ft.
Sukkur.....	India.....	" " " " " " " " " " " "	{ One, 820 ft. One, 548 ft.
Poughkeepsie.....	United States.....	" " " " " " " " " " " "	{ Three, 525 ft. Two, 525 ft.
Tyrone.....	" " " " " " " " " " " "	Single track railway.....	{ One, 520 ft. One, 483 ft.
Kentucky and Indiana.....	" " " " " " " " " " " "	Wagon and railroad.....	{ One, 480 ft. One, 480 ft.
Kanawha.....	" " " " " " " " " " " "	Single track railroad.....	{ One, 480 ft. One, 478 ft.
St. John.....	New Brunswick.....	" " " " " " " " " " " "	{ One, 480 ft. One, 478 ft.
Niagara.....	United States and Canada.....	Double track railroad.....	{ One, 470 ft. One, 470 ft.
Lachine.....	Canada.....	Single track railroad.....	{ Two, 408 ft.

## 2.—Arc Bridges.

Luis Isl.....	Spain.....	Double deck, wagon.....	{ One, 566 ft. One, 525 ft.
Douro.....	Portugal.....	Single track railroad.....	{ One, 541 ft. One, 520 ft.
Garabit.....	France.....	" " " " " " " " " " " "	{ One, 520 ft. Two, 502 ft.
St. Louis.....	United States.....	Wagon and double track railroad.....	{ Two, 509 ft. One, 492 ft.
Washington (Harlem River, N. Y.).....	" " " " " " " " " " " "	Wagon.....	{ One, 492 ft. One, 492 ft.
Paderno.....	Italy.....	Wagon and single track railroad.....	{ One, 492 ft. One, 492 ft.
Richmond, Ind.....	United States.....	Wagon.....	{ One, 492 ft.

## 3.—Stiffened Suspension Bridges.

Brooklyn.....	United States.....	Wagon and double track railroad.....	{ One, 1,595 ft. Two, 930 ft.
Niagara.....	United States and Canada.....	" " " " " " " " " " " "	{ One, 821 ft. One, 800 ft.
Point St., Pittsburgh.....	United States.....	Wagon.....	{ One, 800 ft. One, 492 ft.
Francis Joseph, Prague.....	Bohemia.....	" " " " " " " " " " " "	{ One, 492 ft.

## 4.—Isolated Truss Spans.

Cincinnati (Cin. Southern Railroad).....	United States.....	{ Double track railroad, wagon and street railroad.....	{ One, 550 ft. Two, 490 ft.
Ohio River (Kentucky Central).....	" " " " " " " " " " " "	{ Double wagon and side walk and double-track railroad.....	{ One, 543 ft. Two, 486 ft.
Merchants (St. Louis).....	" " " " " " " " " " " "	Double track railroad.....	{ One, 524 ft. Two, 522 ft.
Henderson.....	" " " " " " " " " " " "	Single track railroad.....	{ One, 522 ft. Two, 520 ft.
Cairo.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ Seven, 408 ft. Two, 515 ft.
Havre de Grace.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ Four, 476 ft. One, 492 ft.
Kuilenberg.....	Holland.....	Double track railroad.....	{ One, 480 ft. One, 446 ft.
Point Pleasant.....	United States.....	Single track railroad.....	{ One, 446 ft. One, 420 ft.
Saltash.....	England.....	Single " " " " " " " " " " " "	{ One, 420 ft. One, 455 ft.
Beaver.....	United States.....	Wagon and railroad.....	{ One, 455 ft. Seven, 419 ft.
Newport & Cincinnati.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ Three, 417 ft. Three, 408 ft.
Hawkesbury.....	New South Wales.....	Double " " " " " " " " " " " "	{ Two, 400 ft. Three, 400 ft.
Nimégue.....	Holland.....	" " " " " " " " " " " "	{ Four, 400 ft. Three, 400 ft.
Bommel.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ Three, 400 ft. Four, 400 ft.
Plattsburgh.....	United States.....	" " " " " " " " " " " "	{ Three, 400 ft. Three, 400 ft.
Bismarck.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ Three, 400 ft. Three, 400 ft.
Sioux City.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ Three, 400 ft. Three, 400 ft.
Landolph.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ Three, 400 ft. Three, 400 ft.
Sibley.....	" " " " " " " " " " " "	Double " " " " " " " " " " " "	{ Three, 400 ft.
		Single " " " " " " " " " " " "	{ Three, 400 ft.

## 5.—Tubular Girders.

Britania, Menai Straits.....	England.....	Double track railroad.....	{ Two, 472 ft. One, 412 ft.
Conway.....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ One, 412 ft.

## 6.—Drawbridges.

New London.....	United States.....	Double track railroad.....	{ " " " " " " " " " " " "
Arthur Kill.....	" " " " " " " " " " " "	Single track railroad.....	{ " " " " " " " " " " " "
Baritan River (Long Branch R. R.).....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ " " " " " " " " " " " "
Louisiana, Mo. (Mississippi River).....	" " " " " " " " " " " "	" " " " " " " " " " " "	{ " " " " " " " " " " " "
Albany & Greenbush.....	" " " " " " " " " " " "	Double track railroad and wagon.....	{ " " " " " " " " " " " "
Fort Madison.....	" " " " " " " " " " " "	Single track railroad.....	{ " " " " " " " " " " " "

150-horse Corliss engine, by Schneider & Co., of Creusot. On an average, 5,000 tires for rolling stock are turned up afresh every year, and half that number of new tires are used annually for repairs alone. 1,100 new wheels are turned out per year. Of car and wagon axles, about 480 are placed annually, which is 0.47 per cent. on the total in use. For locomotives and tenders, about 3,800 steel and iron tires are used yearly for an equal number scrapped, and of these, 3,500 are condemned from ordinary wear, 127 for cracks, and 27 through breaking up. Steel tires average 84,500 miles; iron only 47,700 miles. All locomotive wheels (average) run at an expense for repairs of 20 cents per 400 miles; tender wheels, eight cents.

The shop machines have not the automatic arrangements of American appliances, excepting in the case of small machines as for valve facing or the ingenious contrivances with small emery wheels for finishing the surfaces of recessed side-roads, and surfacing machines in general by which engine parts are completed with a sharp finish not often noticed in America or England. The lathes for axles are certainly not overburdened with automatic arrangements. It is interesting to note the number of axles requiring repair in the course of a year. Out of nearly 800 cranked axles in use, 78 are condemned; 72 being of Bessemer and Martin steels, after making 166,000 miles, and six of iron after serving for about double that distance, i. e., 258,200 miles. Out of as many as 4,570 plain driving axles in service, only 10 are replaced for rupture, but 33 of the same kind were scrapped for other failures. Tender and supporting wheels of engines annually scrapped number 113.

The boiler shop is a fine building about 200 x 300 ft. and sufficiently large to accommodate six boilers end to end (with plenty of working space between) across its width, which is divided by tracks running down its length at a level of about 3 ft. below the main floor of the shop. The size of many of the boilers is 60 in. diameter and the round fire-box top of English pattern is adopted; but for smaller boilers the usual continental square top is still used, although more expensive to build. But few cranes and overhead travelers are to be seen, and this shop has few facilities for the swift handling of boilers, etc. Around the sides of the building the boiler mountings, domes, chimneys, cabs, tanks, and other sheet metal work is done.

Slide valves are made of bronze and phosphor-bronze; the latter contains 84 parts copper to eight of tin, and run

an average of 18,940 miles; the former, with copper 83 and 85 to tin 13, run from 14,000 miles to 35,200 miles without requiring replanning. The durability of valves of bronze and zinc-bronze, and valves of phosphor-bronze and zinc is not found to differ greatly. Phosphor-bronze is proved to be a little superior to ordinary bronze when put to the test on the same engine.

The number of locomotives built by the company varies considerably, as the work is often done by four or five locomotive builders. The price assumed by the builders to be the cost of construction is 15 cents per pound weight. In a year the shops at Paris repair about 113 engines, costing \$126,000, and those at Hellemmes 161 locomotives at an expense of \$158,000. The former comprises four rebuildings, six heavy repairs, 84 medium, 14 small parts and five boiler repairs. Besides this 65 tenders get \$200 repairs each.

In a building set apart and kept at an even temperature are placed the machines for testing the tensile and torsional strengths of metals and quality of oils and ore. There are two engine houses, one a round house with steam turn-table in front, and the other a straight building with about 40 parallel stalls in two sets of 20 each, divided by a steam transfer table about 50 ft. long run by a small engine. The fine compound engines that were in the recent exhibition are in these houses. The usual weighing scales of four platforms, for ascertaining the weight placed on each pair of drivers of an eight-wheeled engine, and a wheel-removing table are noted; the latter is a rolling framework in a pit; the engine is run on across the pit, and screws inside the standards, worked by hand from the platform, soon lowers the supporting rails. Over 700 hands were employed a few years ago, but now 530 is the figure in consequence of the continued growth of the shops at Lille. M. E. Savage is the chief-engineer at Paris and has studied American practice while in the United States, and Mr. F. Mathias is chief of the locomotive and rolling stock, and to the courtesy of the former these particulars are due.

A few comments on cost of work in France may be interesting. An eight-coupled freight engine converted to compound cost \$3,120; seven Gresham & Craven sand jets cost \$43 each; 51 Adams equilibrium slide valves, \$48 each; 16 vacuum brakes, \$320 each; replacing five boilers, \$2,640 each; fitting to 12 locomotives Roy's radial axle boxes, \$53 each; applying 129 brick arches and 92 deflection doors, average \$60 each.



**Combined Duplex Steam Pump and Boiler.**

The combined duplex steam pump and boiler shown herewith are self-contained and mounted on a heavy cast-iron base plate. They are specially adapted for railroad water stations, quarries, contractors, seaside hotels, country residences, manufacturing establishments, etc. Valves are furnished suitable for cold water, hot water, alkaline liquor, or acidulated water. This pump is practically noiseless in its operation, has plain, flat slide valves driven by a positive movement outside of the steam chest and in plain view at all times. The valve motion has no dead centre and the pump is always in readiness for service. The delivery of water is constant and uniform and the speed can be regulated to the utmost nicety for any required service. Regular pattern pumps for general service may be used at any pressure not exceeding 150 pounds per square inch. Low-service pumps are intended for pressures from 25 to 50 pounds per square inch.

They are made in new shops fully equipped with special tools and appliances by men of experience with the steam and power pump trade. All parts are accurately fitted to gauges. The valve gear contains several new features which are controlled by the makers. It is free from springs, cams, supplemental valves and surplus passages. All parts are accessible, and the movement is positive in its action. The water cylinder is fitted with double-acting plungers or double-acting pistons, as required. The water ways and valve areas are particularly large. The plunger rings have a bearing at each end, are fitted into a bored chamber in the barrel, and can be easily replaced. The discharge and suction valves are above the plungers; the pump, therefore, is less liable to lose its charge of water. This feature of the pumps is of value in securing prompt action in emergency, and avoiding the danger of breakage that is incurred with pumps running dry.

The valve seats are screwed in, not driven in on a taper. The valve stem or guard and the valve seat are cast together in one piece. The valve is protected by a metal plate. The spring is of cylindrical form instead of conical, and thus brings a uniform tension upon its entire length. It bears upon the plate at the bottoms and is held and guided by a nut at the top. This nut is secured to the stem by a taper thread, and also by a pin. This construction is a safeguard against the valve getting adrift. Rubber and metal valves can be used interchangeably on the same seats.

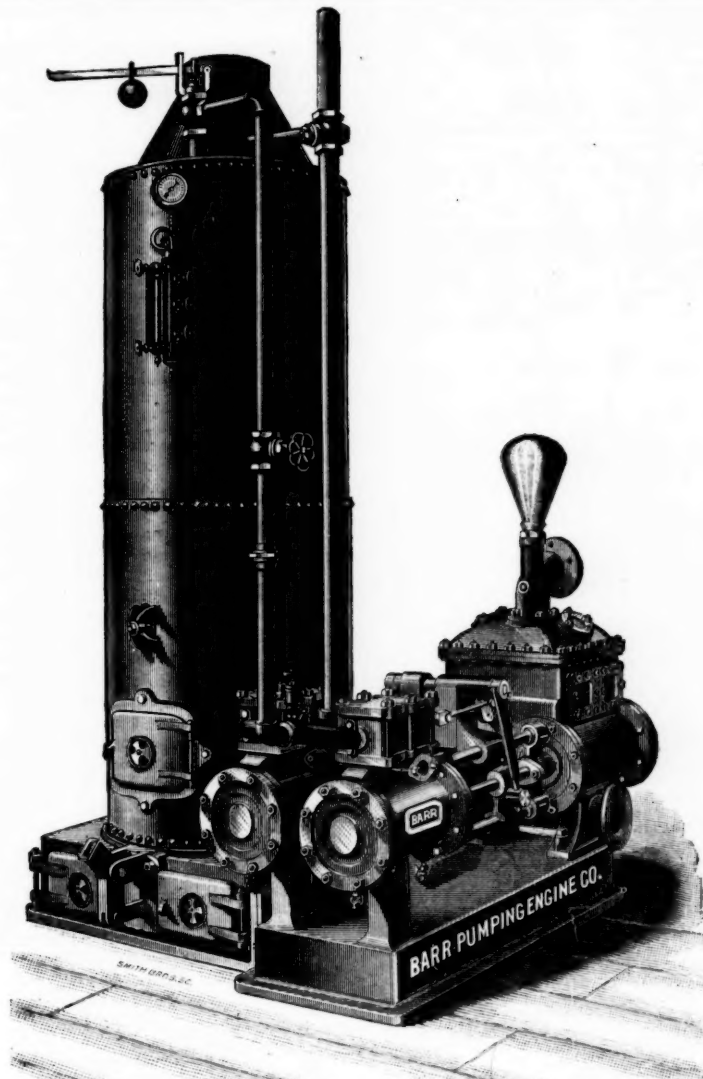
An independent condensing apparatus is provided when desired. In such cases the air-pump pistons are fitted for the use of Tuck's or similar fibrous packing; the water cylinders are lined with brass; the valves are selected with special reference to the service required of them; the piston rods are made of brass, and are water-sealed at the pump end. The independent arrangement permits the apparatus to be started in advance of the engine, thus increasing the power at a time when most needed, and allows the speed to be varied to conform to changing conditions of injection and load. The injection supply to the condenser is controlled by a valve and spray pipe of special design, which secures accurate adjustment and prevents clogging, and a safety attachment is provided which under all circumstances prevents the flooding of the engine. A water seal for the suction valves, as well as for the pistons and rods, is provided. The injection supply, within the limits of suction lift, is raised by the apparatus itself, and the discharge can be delivered to an elevation if desired.

In the combined pump and boiler the vertical boiler is of the regular type; the connections between the two parts of the apparatus do not differ materially from those ordinarily used in this class of machinery. All sizes have shaking grates; the outside connection for this is shown in the cut.

These pumps are made by the Barr Pumping Engine Co., Germantown Junction, Philadelphia, Pa.

**New Plan for Cancellation of Tickets by Baggage Masters.**

Mr. John Sebastian, General Ticket and Passenger Agent of the Chicago, Rock Island & Pacific, has introduced a new form of ticket by which the difficulties attending the use of the ordinary baggage master's punch are in a large degree overcome. The essential feature of the invention, on which application for a patent has been made, is what is called a "baggage coupon," which consists in printing upon the lower left-hand corner of a local ticket the words "When Detached, Baggage Checked." A perforated line across the corner of the ticket enables the baggage man to tear off a triangular piece  $\frac{1}{16} \times \frac{1}{16} \times \frac{1}{2}$  in. The words "When Detached" are printed outside the perforated line, and "Baggage Checked" is on the other side, so that these words stand alone after the corner piece has been separated. This would seem to be a very convenient and effective arrangement, though in the case of tickets made of thin paste-board we are not sure but the detachable corner might cause occasional annoyance by becoming lost. There is, of course, no reasonable liability of such a mishap in legitimate service, as a passenger naturally gets his baggage checked soon after buying the ticket in nearly every case; but the possibility here alluded to would afford a loop-hole for an "argument" by the ras-



COMBINED DUPLEX STEAM PUMP AND BOILER.

cally fellows who take delight in getting 500 lbs. of baggage checked on a single ticket.

On coupon tickets, where detachment of a corner would be inconvenient, the "baggage coupon" is made in the form of a semicircle, with a radius of about  $\frac{3}{8}$  in. This may be located at any convenient point on the side or end. With perforations of the proper depth, this coupon could be gouged out with the thumb nail, though we presume it is not intended that such a primitive method shall be employed.

The reasons which make a device of this kind desirable are clearly stated in the circular issued by Mr. Sebastian to his station agents, from which we quote as follows:

1. We have found considerable imposition practiced by parties who manipulated their tickets in such a manner as to have them honored more than once in the checking of baggage. 2. Because only a limited number of stations have been supplied with B. C. punches. 3. The B. C. punch has been unsatisfactory on account of outside parties cancelling tickets with it in such a manner as to destroy original punch marks made by limited punches, thereby extending the limitation of tickets. The class of tickets is also changed in this way. 4. Baggage men have sometimes cancelled the limitation of tickets in such a manner that conductors have refused to honor them for passage.

We understand that this form of ticket is to be adopted by the Chicago & Northwestern, Union Pacific, West Shore and Chicago & Atlantic. A number of other roads are likely to take similar action.

**Inspection of Bridges.**

In October, 1888, we published a paper by Major C. S. Gadsden, Superintendent of the Charleston & Savannah, on "The Care of Trestles." In that paper was given an abstract of the rules for inspecting bridges on the Savannah, Florida & Western and the Charleston & Savannah. Recently, in the course of some correspondence on the subject with Col. H. S. Haines, General Manager of the Plant system, we have received a copy of these rules, and now give them in full. They were issued in January, 1888.

**Rules for Inspection of Bridges.**—1. An annual inspection of bridges will be made by the inspector of bridges at such times as may be determined by the superintendent.

2. At this annual inspection every part of every bridge, trestle and culvert will be carefully examined and its condition clearly recorded, as soon as it is examined, in a book provided for the purpose (Form Ry. 54).

3. The inspector will begin the examination of each class of members in a bent on the side of road on which mile posts stand, and will record the condition of each member of such class consecutively to the opposite side of the road. In this manner the piles will be examined

first, and in same order the sills, posts (or legs), bottom caps, top caps, corbels, bottom and top stringers in trestle, or chords in queen truss spans, etc. Bents will be numbered consecutively from the abutment nearer Savannah, and stringers, chords, etc., in any span will be numbered with the bent at end of span nearer Savannah. Where a stringer or other part extends over two spans it will be numbered only with the first span.

4. The condition will be recorded as follows:  
"D" indicates dangerous; must be removed at once under direct supervision of inspector.

3 indicates must be removed within three months.

2 indicates must be removed within six months.

1 indicates must be removed within nine months.

1 indicates must be removed within one year.

S indicates safe for more than one year.

5. Particular attention must be paid by the inspector to the character of work done, and any defects in fitting joints or pins, the absence of any part required by the standard plans, or the presence of any part not required by the standard plans, must be noted in column of "remarks."

6. Truss bridges other than the ordinary "queen truss spans" must be inspected and their general condition, together with the appearance of any movement of the bridge, as a whole, or any of its members, or any apparent defect in material, must be recorded on the pages provided for that purpose (Form Ry. 54) in inspection book, and copies of such records must be sent to the chief engineer immediately after the inspection.

Inspection of truss bridges must be made under the following rules:

**Wooden or Combination Bridges.**—A. Examine the general condition of timber in wooden bridges, particularly at the connections. Note whether sound or in any way decayed, and whether the fibres show any tendency to crush. Examine the bottom and top ends of braces to ascertain whether the iron shoe or the timber toe is in good condition; note whether nuts on bolts and rods are tight.

B. The weakest point of old bridges is generally the floor system, therefore examine critically whether the timbers forming it are sound. Note condition of cross-ties and guard rails.

C. Ascertain camber of bridge when unloaded, and measure accurately the deflection under a passing train; always report number of engine and character of train observed.

D. Examine condition of paint, whether the wood is exposed and whether the rods and bolts show any signs of rust.

**Iron Bridges.**—E. Examine general condition of bridge, noting any movement or creeping as a whole, and any defect in any member.

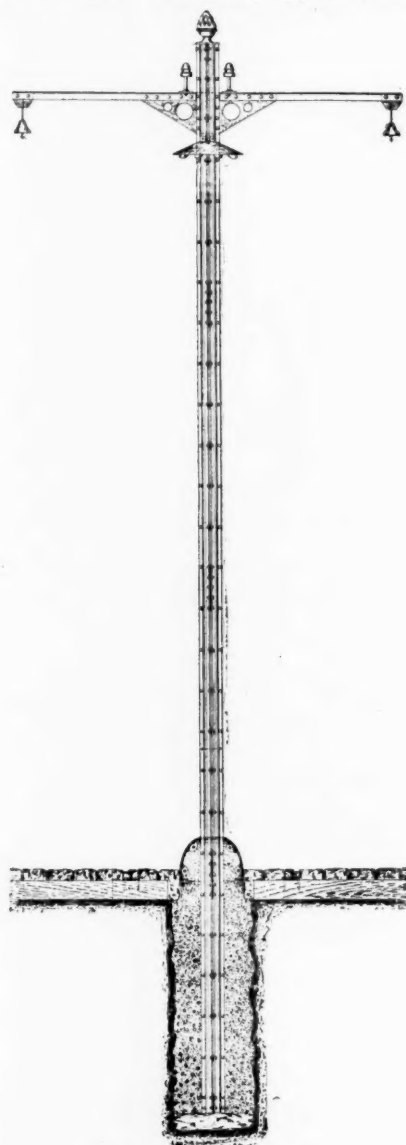
F. Shake counter rods in order to ascertain whether they are tight. Rattling during the passage of a train does not indicate necessity for tightening these rods, which should be kept reasonably tight, but not be violently strained. Note that rods working side by side must be equally tight. Examine nuts on ends of pins and see that they are in place.

G. Examine the rollers under end shoe and see that they are kept clear of dirt.

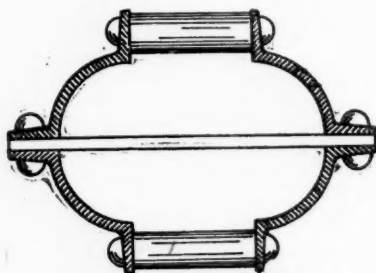
H. Note condition of lateral rods, whether kept tight; when found slack they should be tightened and nuts set.  
I. Examine critically connections between floor beams and truss and between stringers and floor beams; tap rivets to ascertain if tight.  
K. In drawbridges, in addition to the above, examine the turning gear, note whether all wheels revolve when bridge is turned. Note locking apparatus, whether

in accordance with the standard plans and specifications.

The form of report referred to above (Form Ry. 84) has a column for each member of the wooden trestles, and in these columns the symbols prescribed in the fourth section are entered.



For Use between Tracks.



Horizontal Section.

wedges lift ends properly; if not, do not adjust, but report condition immediately.

L. Ascertain camber of fixed spans and note deflection under passing trains; give number of engine and character of train.

M. At drawbridges note whether one end rises when train is on the other end, and if so, how much.

N. Examine all woodwork, as per instructions in paragraph B. Note whether iron shows rust, and if painting is needed.

O. Examine all foundations, piers and abutments, when accessible, noting any apparent defects.

7. A. Immediately after the inspection of the bridges and trestles on each division the inspector must furnish the superintendent and master of roadway with a statement on forms Ry. 84 and 85, in accordance with section 4th.

B. The master of roadway will report to the superintendent when the repairs are completed, which reports will be forwarded to the general manager.

8. Supervisors will inspect all structures on their respective divisions without relying upon the inspector's reports for information as to their condition.

**Premiums to Bridge Foreman.**—At the end of each calendar quarter the bridge foreman on each road who will have put his timber in at the least cost per thousand feet, board measure, will be rewarded with a premium of \$15; at the same time a premium of \$10 will be given to the bridge foreman who will have made the next best showing.

The conditions of these premiums are as follows:

A. Only actual time devoted to bridge work will be considered, and 15 minutes will be allowed for each train passing through during working hours.

B. All timber put in will be considered.

C. The work done must be strictly workmanlike, and

#### A New Electric Wire Pole.

The handsome electric wire pole illustrated herewith is formed of four sections of the Phoenix column iron riveted together as shown in the detail cut with tie plates, placed equidistant, and with lacing inserted near the bottom end where is the greatest strain. The pole tapers in the direction of the wires, but has parallel sides at right angles thereto, as shown.

These poles are light, durable and cheap, and, being open, the inside can be reached to be painted.

The pole was recently tested at Post & McCord's works in Brooklyn by a Fairbanks dynamometer. With a pull of 800 lbs. at the top the deflection was less than 4 in. The deflection took place in a regular curve and showed no irregular bending such as the pipe pole does at the joints. A block and tackle was then attached to the upper end of the pole and eight men pulled on the rope. Unfortunately the concrete was not dry and the pole moved bodily in the earth, the top being moved some 6 ft., breaking the concrete up in lumps. When taken out of the ground the permanent set was so small that the pole was readily straightened in jaws.

The centre pole for use between the tracks has its longest diameter parallel with the rails, and when arranged with an ornamental top and lamps makes a very good looking pole. The cross-arms can be made separate from the pole if desired so for shipment, and bolted on after it is set in the ground. A cast-iron bumper to keep wagon wheels from striking the pole is provided at the bottom. This is made in two halves, bolted together on the inside, and can be filled with concrete, as shown in the cut, if desired.

At present a number of these poles are being made for the Jersey City & Bergen Railway Co., which recently closed a contract for the equipment of their lines with the Thomson-Houston Co.

This pole is built under the Milliken patent, the agent for which is L. W. Serrell, at 115 Broadway, New York City.

#### Bridging Alluvial Punjab Rivers.

During winter, which is, in India, the dry season, these river beds silt up, and their channels are then both shallow and narrow, to an extent that admits of many of the piers being commenced on practically dry land. The base of the pier is invariably one or more wells formed after once the well curbs are pitched by building up a length of masonry and then sinking it by dredging out the ground inside. In the early Punjab bridges over the Beas and Sutlej, 40 ft. deep was conceived to be amply safe against scour, with spans of 100 ft. clear, a view that disastrous experience has modified to the extent of making first 70 ft., and then 105 ft., the vogue. The present fashion takes its stand at 75 ft. deep, with, in all cases and at all depths, a mass of rough stone put round each pier in order to keep the scour at arm's length. As to the depth, it should be understood that in probably every case yet treated there is practically no finality in the sense of getting down to a better stratum, and the wells stand when concreted up merely on sand or silt as it may happen, and depend for their stability very largely on the lateral friction of the strata they pass through, a factor that disappears when the strata are scoured away long before the base of the well is actually undermined. The friction in question has necessarily to be overcome in the process of well sinking, and is at times so enormous that an addition of 1,500 tons in air added to another 1,500 tons of masonry, reduced by half from being submerged, has failed to push down a well of less than 20 ft. diameter, although a hole some 15 ft. deep had been dredged under its curb, which was then 102 ft. in the ground. This particular case happened to the centre well of a group of three, when both flank wells were down to 103½ ft., and it is probable that the side wells helped to hamper the descent of the third.

In all cases, as has been said, the piers have to be protected against dangerous scour by stone pitching, and as the river bed, even when not dry, is invariably shallow at the time when the pitching can be handled, the practice is to lay this—just as in the breakwater—in the form of an apron, which, when underscoured and engulfed, takes automatically the position of a curtain, or rather, in the case of a pier, that of a conical mound, generally egg-shaped in plan by dint of the apron falling into the hole that the scour creates. As a rule, the stone, as it falls in water, assumes a slope of about 2 to 1, and the condition aimed at is that the slopes of the cone should terminate upwards at or very near low water, in order to at once conserve a maximum proportion of the friction which is desirable in the interest of the well's stability, and to, at the same time, enable the engineers to know with certainty that the cone of stone is there, and has not rolled away with the current. In practice with a 75-ft. well it is not held safe to let the crest of the cone that surrounds a pier or foundation

sink much lower than 15 ft. below low water, and this, which leaves from 25 ft. to 30 ft. of the pier exposed to the direct thrust of the stream, is a condition in which the absolute safety of a foundation is not always easily ascertainable.

As already said, the stone, if it stands at all, stands at about 2 to 1, a resultant that is the outcome of the speed, depth, and the time of the attack, as modified by the weight, size and shape of the stone. Whether the stone round the piers ultimately stands or rolls away, its angle of repose while it does stand being practically invariable, in an ordinary span the slopes of the cones round two adjacent piers tend to meet each other in mid-span, and do in fact so meet if the spans are not very great. In a span of 100 ft., for instance, the cones must meet at, under normal conditions, a depth of 25 ft., while in spans of 200 ft. this meeting will ordinarily take place, if at all, at 50 ft. below low water. Here there is obviously a most enormous difference between the discharging power, foot per foot, of the two spans.

This case is clearly quite a different one to that for which the popular formula is designed that makes the cheapest span that which equates the cost of the girder to that of the pier, an equation that in cases of the class under consideration obviously does not apply. The result arrived at is one of much interest, for *inter alia* it justifies, explicable and solid grounds, the conclusion at which engineers had previously arrived, perhaps intuitively, that there is a good deal more in large spans than the mere honor and glory of building to outvie previous efforts, and that apart from the comparative certainty with which the cost of spans, as compared with that of foundations, can be estimated, the present practice of large spans has a basis that is, in fact, demonstrably true in a large class of cases.

Not only is it the case as proved in Indian experience that large spans are more effective, but they are also cheaper and safer, both to construct and to maintain. These views are simply borne out by actual experience in such rivers, for if they are correct we shall expect to find that the wastage of stone in bridges with small spans, no matter how wide the bridge, is very great indeed as compared with cases where the spans are large, and that is exactly what experience shows to be the case. On the same river, spans of 100 ft. have swallowed up as much as 120,000 cubic ft. of stone per pier; spans of 150 ft., 90,000 cubic ft., and spans of 250 ft., 75,000 cubic ft.; i. e., per foot of span, 1,200, 600 and 300 cubic ft. of stone, and in the last case the original supply stands good after 12 years, while in the first, one pier or other demands further support in the shape of stone, year by year.—*Engineering*.

#### Creosoting Ties in France.

The practice of the Eastern Railroad Co. of France in creosoting ties is briefly described in a recent issue of the *Revue Générale des Chemin de Fer*. Ties as delivered are piled and seasoned in the open air. They are then adzed and bored by a special machine, loaded on trucks and run into a drying oven, where they remain 24 hours or more. After drying at a temperature of about 176 degrees Fahr., they are run into a metal cylinder 6 feet 3 inches in diameter and 36 feet long, which is hermetically closed. The air is then exhausted and a partial vacuum is maintained for about half an hour. Communication is then opened with reservoirs of dead oil, which is allowed to flow in at a temperature of 176 degrees Fahr., under pressure. When the oil ceases to flow under moderate pressure it is forced in by a pump up to a pressure of 83 lbs. per square inch, and this pressure is maintained for an hour or an hour and a quarter. Communication with the oil reservoirs is then opened again and the excess of oil not absorbed by the timber flows back into the reservoir. The cylinders hold 168 ties each. The quantity of oil absorbed is measured by determining the difference in volume of the oil before and after operation. The wood used is principally oak and beech. The oak ties absorb from 2.4 to 2.7 quarts per cubic foot; beech ties from 8.7 to 10 quarts per cubic foot. The whole operation takes about four hours. This method of treatment has been practiced by the company since 1865, with, it is stated, very good results. After 15 years of service the ties taken out have been 15 per cent. for creosoted oak and 50 per cent. for creosoted beech.

#### National Public Works—Report of a Committee of the Boston Society of Civil Engineers.

There has been expended under the direction of the corps of engineers, U. S. A., about \$200,000,000, and we fail to find one instance of an United States engineer untrue to his trust. The high sense of honor created in the individual members of the corps by the special training and the complete freedom from political influence, together with the sense that they belong to so honorable a corps, removes all desire of dishonesty.

The various works on engineering subjects by such men as Humphries, Abbot, Mahan, Gilmore, Weitzel, Newton, Cramb and Mills are strong proofs that the United States engineers are alive to progress, and keep well up to the times. A. D. Bache, in his complete reorganization of the Coast Survey, showed the value of his education at West Point and his experience in the field. Some of the finest docks and canal work have been done under United States engineers, while the Hell Gate mine and deepening of channel we all know of.

It is our opinion that the United States engineers have been, and now are, handicapped by eccentric appropriations from Congress, that add to the cost of works by failing to allow them to be carried to completion at once. If there is a way to remedy this defect, it should surely be applied. . . . If there is an army, there must be an engineer corps. If there is a war, there must be an army. An engineer corps without experience would be of very little value, while it would be impracticable to hold an organization of this character together without giving the officers something to do, and we know of no better occupation than is that which they now have.

The present arrangement of employing civil engineers is not planned to give the best talent. As far as tenure of office is concerned, that seems to depend on the appropriation; and with the present system, or rather want of system, of giving money for such works, there cannot be many attractions for any engineer of experience or skill. In this respect the government is the loser,



and there should be a change. The government should in some way be able to command the best the country affords, and should hold out proper positions and compensations to secure them.

The question of a civil pension list seems to be contrary to our free institutions, and should not be introduced without careful study and mature deliberation. At the first glance, the same reasons do not hold to the civil as to the military officer. If we examine more closely, we will find that the United States civil engineer is for the most part employed on a class of work almost entirely performed by government, and his experience is not of a kind to help him in private practice. After devoting years to this work, there would seem to be no good chance for him to start out for himself, while the small salaries in the service do not tend to make him independent. While we see defects in the present system, we are not so clear as to the best methods of applying the remedy.

In conclusion, we feel impelled to recommend that whatever action we take shall be in the form of a memorial, asking for the appointment of a commission, to consist of, say, two United States engineers, two civil engineers, two merchants, and one lawyer, said commission to examine into the whole subject of national public works, and work out some scheme whereby the much-needed improvements may be effected. Without some such commission, the whole subject is liable to be confused and possibly illegal. The civil engineers will be accused of selfish motives in advocating, while the United States engineers will be charged with the same in opposing, any change, and, between the two, nothing will be done.

#### Dimensions and Loads on English Car Axles.

The following table gives the dimensions of and the loads upon some of the English passenger car axles. The initials given indicate the following roads: G. S. W., Great Southern & Western, of Ireland; L. N. W., London & Northwestern; M. R., Midland Railway; G. W. Great Western; L. Y. R., Lancashire & Yorkshire.

	G. S. W.	G. S. W.	L. N. W.	M. R.	G. W.	L. Y. R.
Diameter in the centre.....	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
" wheel seat.....	0 4 1/2	0 4 1/2	0 4 1/2	0 4 1/2	0 4 1/2	0 4 1/2
" journal.....	0 3 1/2	0 3 1/2	0 3 1/2	0 3 1/2	0 3 1/2	0 3 1/2
Length of journal.....	0 6 1/2	0 8	0 8	0 8	0 8	0 8
Radius of curves at end of journal.....	0 1 1/2	0 1 1/2	0 1 1/2	0 1 1/2	0 1 1/2	0 1 1/2
Diameter of collar.....	0 4 1/2	0 4 1/2	0 4 1/2	0 4 1/2	0 4 1/2	0 4 1/2
Length of.....	0 1 1/2	0 1 1/2	0 1 1/2	0 1 1/2	0 1 1/2	0 1 1/2
Centres of journals.....	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2
Total length of axle.....	7 8 1/2	7 10	7 10	7 10	7 10	7 10
Weight on each axle.....	lbs. 12,500	lbs. 12,700	lbs. 13,780	lbs. 13,940	lbs. 15,950	lbs. 10,760
Number of passengers per axle.....	24	14			30	

The second column marked G. S. & W. gives dimensions for the 45-foot composite carriage.

#### TECHNICAL.

##### Manufacturing and Business.

The Fishkill Landing Machine Co., of Fishkill-on-the-Hudson, N. Y., has just completed a vertical condensing engine of 1,000 H. P. for the new grain elevator of the New York Central & Hudson River road at the foot of Sixtieth street, North River, New York City. The company has also recently received an order for a similar engine of 800 H. P. for an elevator to be built for the West Shore road at Weehawken, N. J. These engines will be fitted with the Fishkill-Corliss valve gear. The engines built by this company are usually of the horizontal type, but owing to the limited space in grain elevators these are made vertical, although the cost is considerably more. The Fishkill Landing Machine Co. is very busy at present and the works are frequently run overtime.

Owing to the increasing demand for air compressors for aerating crude petroleum, elevating acids, etc., in addition to those required for mining and tunneling purposes, the Clayton Air Compressor Works, 43 Dey street, New York City, has found it necessary to add several new lathes and other important machinery to its plant in Brooklyn, and is now prepared to fill all orders promptly.

The air brake regulator made by the Mason Regulator Co., of Boston, has been tested by the Chicago, Rock Island & Pacific, and that company has placed a large order for them.

The McConway & Torley Co., of Pittsburgh, is erecting an addition to its annealing department. Twelve pairs of ovens, each to hold 24 pots, will be built, increasing the capacity for malleable iron castings.

D. M. Cruikshank, of Providence, R. I., shipped last month two 100 H. P. locomotive boilers, one 50 H. P. horizontal tubular boiler, one 40 H. P. horizontal tubular boiler and six 20 H. P. upright tubular boilers, also a 12x30 Greene automatic cut-off engine, an 8x12 plain slide-valve engine, and several small engines. The present building is to be enlarged.

The Northwestern Malleable Iron Co.'s Works, at Milwaukee, Wis., which were recently partially destroyed by fire, are again in full operation.

The Pneumatic Railroad & Town Gate Co., of Chicago, will move its plant to Jenisonville, a town 8 miles from Grand Rapids, Mich. The company has been reorganized with a capital of \$300,000.

The Pond Tool & Machine Co., of Plainfield, N. J., has been awarded a government contract to build ten great lathes, for use in making the large guns near Troy, N. Y. Each lathe will cost \$25,000. Three years are allowed to complete the contract.

#### Iron and Steel.

Carnegie, Phipps & Co., of Pittsburgh, are extensively remodeling their rod mill at Beaver Falls. They will construct a sloping floor some 70 ft. long on either side of the principal rod train, to enable continuous rolling on small rods. A pair of 36 x 48 in. 1,200 h. p. Porter-Hamilton slide-valve engines are being put in. The valves have 8-in. travel, and are of Prof. J. E. Sweet's patent.

Samuel Tretheway & Co., Ltd., of Pittsburgh, have a contract for four very large shear knives, each weighing 800 lbs. They are for the Homestead mill of Carnegie, Phipps & Co. The firm has recently made shipments of

steam hammers to Washington, Greensburg, Bradford and Titusville.

The Carnegie Land Co. of Johnson City, Tenn., have contracted for the construction of four 145-ton blast furnaces, one to be completed this year. The furnace will be 75 ft. high, with 9-ft. hearth, 16-ft. bosh, three 18-ft. Whitwell stoves, and boiler and blowing engines sufficient for 150 tons a day; and 90-ton Gordon blowing engines. The casthouse of the furnace will be 54 x 150 ft.; stockhouse 250 x 98 ft. All the machinery has been purchased.

Contracts for the new rolling-mill plant of the Muskegon Iron & Steel Co. of Muskegon, Mich., will be let shortly.

The Crozer Iron Co. has let the contract for rebuilding its casting house to the American Bridge & Iron Co., of Roanoke, Va.

The property of the Sheffield & Birmingham Coal, Iron & Railway Co. has been sold to satisfy a mortgage of the Central Trust Co., of New York, for \$1,400,000. The properties sold consisted of three blast furnaces at Sheffield, Ala., and mineral land and rights in Walter Winston, Fayette and Marion counties, embracing about 70,000 acres, which were bought by Napoleon Hill, of Memphis, Tenn., for \$350,000; also, over 5,000 acres of mineral and coal lands and rights in Walker and Jefferson counties, Ala., which were bought by J. O. Nelly, of Memphis, Tenn., at \$115,000.

The plant of the Findlay Iron & Steel Co., of Findlay, O., is to be enlarged and improved.

The Ohio Falls Iron Works, of New Albany, Ind., have had a steady run of nine months, since July 17, 1889, except five days. The guide mill will be stopped soon for 10 days, to put in a new and heavier train. During this time they will run all the other departments. The company makes merchant bar and bridge iron, especially for railroad use and car and agricultural works.

McClure & Amsler, of Pittsburgh, have the contract for the erection of the blast furnace of the Roanoke Iron Co. at Roanoke, Va. Work on the contract has been going on for some time. The same firm is also building an auxiliary stove for the Missouri Furnace Co., of St. Louis.

#### The Rail Market.

Steel Rails.—The competition, especially between the Pittsburgh mills, is very sharp, and this has resulted in several contracts being placed at relatively small prices. The eastern mills see little business in their territory, and in the South the Pittsburgh mills are in active competition with them. The orders of the latter mills during the past week are reported to aggregate 28,000 tons, one securing 16,000 tons for the Northern Pacific, and the other two orders in the Southwest and one in Ohio. Quotations are: In the East, \$33; at Pittsburgh, \$33@ \$34 for heavy sections; and at Chicago, \$35.

Old Rails.—Quotations are: At New York, \$23.50@ \$24, and at Pittsburgh \$24@ \$24.50 for old iron rails, and \$21@ \$22 for old steel rails; at Chicago, \$22.50@ \$23 for old iron rails, and \$19@ \$19.50 and \$20.50 for old steel rails.

#### Railroad Shops and Buildings.

The Georgia Southern & Florida and Macon & Birmingham have bought 19 acres of land just outside the city limits of Macon, Ga., and will erect a shop, warehouse and a large cotton compress at a cost of over \$100,000. The roads paid about \$1,000 per acre for the land.

The West Virginia Central & Pittsburgh is to erect a new office building at Cumberland, Md. It will be of brick 60 ft. long and 30 ft. wide. The contract for the building has been awarded to Graves & Weber, of Cumberland.

The Chattanooga, Rome & Columbus will, it is reported, build car shops at Bremen, Ga.

#### The Cyclone Steam Snow Plow.

Suit has been brought in the United States Court at St. Paul, Minn., by the Cyclone Steam Snow Plow Co. vs. Wm. H. Truesdale, for an injunction to restrain him from using the snow plow he recently purchased from the Leslie Bros. Mfg. Co. as Receiver for the Minneapolis & St. Louis Railway Co. The Cyclone people claim that the new wheel lately adopted by the Leslie Bros. Mfg. Co. is an infringement on patents held by them.

#### Brick Arches in Fire Boxes.

The Secretary of the American Master Mechanics' Association has just issued the following circular for the committee appointed in July last year to report on the subject "Brick Arches in Locomotive Fire Boxes." As this is the last circular of inquiry that will be issued till after next convention, the replies for this and the other circulars should be sent in immediately, as the reports must be in the hands of the Secretary by June 1. The subject is stated as follows: "Best manner of supporting the arch. Their efficiency in consuming the various gases composing black smoke. Saving of fuel when used in connection with extension front, and as compared with 'diamond' stack. First cost and cost of maintenance."

The committee respectfully request answers to the following questions:

1. How do you support the brick arch in your fire boxes?
2. If with "circulation pipes," do you have trouble with the pipes in any way?
3. If with lugs or projections screwed to side sheets, do you find the lugs burn off very fast?
4. Do you use flat or arched bricks?
5. Can you run an arch until it burns out, or do you have to remove them before this, in order to clear flues?
6. Do you find the arch causes damage to fire-box sheets? If so, in what way?
7. Do you think the arch assists in consuming the various gases composing black smoke?
8. Do you think more perfect combustion is obtained with the arch by checking the passage of smoke and gases through tubes, and causing them to mingle and be longer exposed to heat?
9. Do you think there is a saving of fuel with the arch in connection with the extension front, as compared with short front and diamond stack?
10. Can you give any data confirming your opinion as to saving of fuel?
11. About what does it cost you to apply the arch and extension front?
12. How do you consider the cost of maintaining the arch and extension front compares with keeping up the diamond stack, cone, netting, lining, etc.?
13. Do you consider that the arch and extension front greatly lessen the throwing of live or dangerous sparks, and also prevents much of the finer dirt, etc., thrown from stacks from striking cars in train?
14. Do you find that flues stop up or clog with cinders, etc., as easily when the arch is used as without it?
15. If you know of any points for or against the brick arch not covered by these questions, please name them.

The committee desire to make as complete a report as

possible. Members will please furnish any blue prints, sketches, or any data they can relating to the subject. Replies to be sent to T. W. Gentry, Master Mechanic, R. & D. R. R., Richmond, Va.

#### Combination of German Locomotive Builders.

German locomotive builders have formed a combination, the duration of which is fixed at five years. For a long time this trade suffered through excessive competition, but about a year ago the makers began gradually to advance their prices. It appears probable that the new convention will give a powerful impetus to the upward movement of prices. In the tenders received by the Prussian State Railway a few days ago, the prices quoted were much above those in former tenders. For express locomotives with tenders \$12,725 was asked, for ordinary passenger locomotives with tenders \$12,212, and for ordinary freight locomotives \$10,875 by one maker and \$11,250 by the rest. The increase compared with former tenders represent \$2,000 in the case of express and freight locomotives.

#### THE SCRAP HEAP.

##### Notes.

The St. Louis, Iron Mountain & Southern is to erect a large grain elevator in Memphis.

The Delaware & Hudson Canal Co. is erecting in Albany, N. Y., a building for the general offices of the railroad department of the company.

Ten employees of the Erie shops at Port Jervis have recently been discharged for allowing unauthorized persons to use their mileage books.

The New York, Lake Erie & Western has its equipment for the operation of the block system nearly ready for use over the whole of the Delaware and Susquehanna divisions, 244 miles.

It is stated that train collectors, to act independent of conductors, are to be placed on the Chicago division of the Cleveland, Cincinnati Chicago & St. Louis, and on the Cincinnati division of the Chesapeake & Ohio.

A number of old locomotive engineers in the neighborhood of Chicago, who ran engines on the Galena & Chicago Union Railroad prior to 1880, are going to hold a reunion and talk over the stories of the round house. Out of ten who live in Chicago now, it is said that only three are still engineers.

A bill has been reported favorably from the Senate Committee on Interstate Commerce to give the Interstate Commerce Commission authority to prosecute inquiries into alleged violations of the law by means of special agents to be appointed by the commission, who shall have power to administer oaths and send for persons and papers.

A Chicago paper prints a letter said to have been received by various railroad managers from John Livingston, in which he states that leading railroads have paid him \$380 for his trouble in asking the Interstate Commerce Commission to drop his complaint about the free transportation of employees' families. The object of the letter is to convey a gentle hint to the recipients to increase the \$380 by \$50 each, "or such smaller sum as may be deemed proper."

The Maryland legislature has amended the continuous heating law by extending the time during which cars may be heated by stoves from May 1, 1890, until May 1, 1891. It is also provided that if by the last-mentioned date satisfactory evidence shall be furnished to the board of public works that no reasonably safe and practicable substitute for stoves as a means of heating cars has been found, then the board may extend the time during which stoves may be used on cars until May 1, 1892.

The New York Railroad Commissioners have rendered a decision in the matter of the complaint of citizens of Rochester against the New York Central & Hudson River, and the Buffalo, Rochester & Pittsburgh, in regard to grade crossings. The Board recommends the erection of the necessary gates, thoroughly excluding pedestrians and teams, and a subway at Canal street for pedestrians. These suggested subways should be for each sidewalk; they should be 9 ft. wide and 7 ft. 6 in. in clear under track stringers. Strongly inclined lift gates and subways are recommended for other streets.

#### The St. George Disaster.

A jury at Toronto, Ont., has found a verdict for the plaintiffs in the suit for \$200,000 damages against the Grand Trunk on account of the St. George disaster near Hamilton, 14 months ago, when a train went through a bridge, killing a dozen passengers. The trial lasted 100 days and cost many thousand dollars. A number of experts were examined. The rate of speed of the train was found to have been 50 miles an hour, and the brakes were not applied at the proper time. It is said also that some of the floor timbers of the bridge were found unsound. It will be remembered that the coroner's jury found the cause to be a broken tire, and exonerated the company.

#### Rapid Transit in New York.

The New York Assembly has passed the so-called Fassett Rapid Transit bill by a vote of 78 to 34. This bill provides that the Mayor of New York shall appoint the commissioners to lay the routes and otherwise provide for the building of rapid transit lines. As the bill has still to pass the Senate and the Governor its fate is somewhat doubtful.

#### Completion of the Delagoa Bay Railroad.

Advices from Lourenzo-Marquez, in Delagoa Bay, South Africa, say that the railroad from Delagoa Bay to the frontier of the Transvaal Republic has been completed and opened for traffic. The opening of the line was celebrated by a banquet, which was attended by the Portuguese officials and representatives of the Dutch company interested in the line. The *Economista* (Lisbon), in a semi-official article, insists that Portugal has no contract with the Delagoa Bay Railroad Co.

#### The Port Richmond Terminals.

The following account of the changes to be made by the Philadelphia & Reading at Port Richmond we understand to be substantially correct. Six miles of additional sidings will be laid, and a new shipping pier is to be built that will have a capacity for loading 40,000 tons of coal a day into barges and vessels. In addition to this, a coaling station for locomotives is being erected, which will be equipped with link-belt machinery for loading coal into the tenders of the engines. Another car-float slip will be constructed to accommodate the freight traffic between Port Richmond and the Reading's new Delaware avenue station in Philadelphia. Additional platforms and storage warehouses are to be erected, as well as other improvements.





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#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Inquiries from correspondents call to mind the fact that the large amount and variety of information concerning the block system, which has appeared in various departments of the *Railroad Gazette* during the past few years, is unavailable for ready reference by reason of its unclassified condition. To meet the wants of those who have felt the need of a condensed summary on this subject, we have prepared some notes on the present practice of our principal roads, and an installment of these notes appears in this issue. Those who find this matter too elementary will, of course, bear in mind that they can select such portions as they need, while if we pursued the opposite plan, and wrote only for experts, the value of the articles for readers of less experience would be much impaired if not destroyed.

In this issue will be found the report made a month ago by a committee of the Boston Society of Civil Engineers on National Public Works. One familiar with what has been done in years past will be reminded by this report of the conditions which have always kept movements for reorganizing the civil public works from resulting in anything more than the expenditure of time and breath, and the generation of more or less bad feeling. The greatest obstacle to any advance has been the lack of co-operation among the civil engineers. The Boston Society committee now makes a report ignoring all that has been done so far, and recommending the appointment of a commission to examine into the whole subject and work out some scheme of reform. No one needed to be told that the corps of engineers of the United States Army is a body of men with a record of financial trustworthiness probably unparalleled. No one needed to be reminded that they have made splendid contributions to the professional work and literature of our country. Every one admits all this and is proud of it. Pretty nearly every one knows, too, that the methods of Congress are ridiculous and extravagant. That is past discussion now. Instead of telling a few generalities with which we are all familiar, why did not the Boston Society's Committee point out some of the reasons why that society should not join in a movement already organized, and which has made some progress? The report has the air of being a purely perfunctory document, and perhaps we take it more seriously than its authors intended that it should be taken.

It is a somewhat curious fact that, after three years' operation of the Interstate Commerce Law, the East is better satisfied with it than the West. The average

Eastern business man will say that the advantages in the way of publicity of rates have been worth a great deal to him, and have, on the whole, much more than balanced the losses incident to the operation of the act. Western men, on the other hand, and especially those who do business at large trade centres, are disposed to complain that it does them more harm than good. At a meeting of the Commercial Club of Kansas City, a week ago, the report of the committee on transportation favored the entire repeal of the act; and the resolutions actually adopted by the club, without going so far as this, urged the passage of amendments which would grant everything that a sensible railroad man ought to demand. These amendments would so modify the short-haul clause as to allow lower rates at competitive points than at intermediate ones, and would allow contracts for division of business between different roads in case the divisions themselves and the resulting rate schedules had first been approved by the Interstate Commerce Commission. There is nothing specially new in these proposals. The significant fact is that they are now urged in behalf of the shippers rather than the railroads. It illustrates the point which we have so often urged, that bad railroad economy is in the long run bad public economy also. There can be no doubt that it is cheaper for the railroads to handle business in masses from competitive points than under any other conditions. It is true that this difference has been exaggerated, and that too much weight has been given to it in many of the railroad tariffs of past years; but this does not alter the fact that there is a difference. The Interstate Commerce Law forbade the railroads to take advantage of this difference, and therefore prevented them from giving the public the advantage of it. The decisions of the Commission with regard to carload and export rates have tended to intensify the evil. To the East this made comparatively little difference; but to the Western business man, alive to every opportunity to enlarge his trade, it was a heavy burden. It practically said to the railroads, "You shall not give Kansas City the best rates warranted by the trade conditions of Kansas City, but only such as are warranted by the conditions of local points in Missouri." The present protest is the natural outcome of the effects of such restriction.

#### Uniform Classification and Carload Rates.

The Interstate Commerce Commission is engaged in two conflicting efforts without apparently seeing their inconsistency. It is trying to secure uniform classification all over the country; it is also trying to reduce the difference between carload and less than carload rates on the same article. Which they will ultimately sacrifice we do not know; but we are confident that they will have to sacrifice one of the two objects in order to get either. Uniform classification not only tends, but must tend, to put carloads and less than carloads further apart.

The reason for this is readily seen when we consider what are the obstacles which hinder the attainment of uniformity. They are vaguely summed up by saying that the needs of traffic in one section are different from those in another. This really means that low rates on certain articles will develop traffic rapidly in some districts and not in others. If a reduction will develop a large traffic, it is good economy for the railroads to adopt it, because the increased business is good in itself and can be handled with special economy. Under the same circumstances, it is bad for the public to refuse such a reduction, because it shows that the high rates prevent the existence of a large trade which might otherwise be developed. But if, in another part of the country, a reduction in rates is followed by no corresponding gain in volume, it is bad for the railroads to grant it, and not by any means a severe burden to the public to refuse it.

If each district has its own classification reductions can be made whenever good railroad economy permits it. But the differences and irregularities which would result from this are so great as to cause much inconvenience to shippers. The Interstate Commerce Commission is so impressed with these evils that it would have us go to the other extreme, and only allow articles to be classed low when the general conditions all over the country permit it. This would be a serious burden upon trade. It would practically amount to saying to the railroads of the Pacific coast, "You shall not make low rates to develop business of any kind, unless the railroads of New England can afford to make relatively low rates on business of the same kind." Where the conditions of traffic are so different it is bad policy, from a public as well as from a railroad standpoint, to force the adoption of exactly the same schedule everywhere.

There is one practicable line of compromise. In

those districts where business will develop so rapidly as to make it desirable to classify it lower than elsewhere, it will usually be furnished in carloads. When it comes in this way it often creates special conditions of railroad economy which it is a public misfortune to disregard. On the other hand, in those districts where it does not develop, it is more likely to be furnished in small lots—usually less than carloads. By allowing a reduction in the carload rate without a corresponding reduction on the parcels rate, we compromise between the needs of both sections, allowing a lower rate where it pays to develop traffic at that rate, and refusing to allow it elsewhere.

Unfortunately, this is a kind of reasoning to which the Interstate Commerce Commission objects. It insists that the differences between carload and less than carload shall be based on a direct comparison of expenses rather than an indirect one. The difference between carload and parcels rates on an article must be determined by differences of cost in the same district or on the same route; not by general differences between districts where carload and parcels shipments respectively prevail.

As a result matters must become strained. If a set of railroads wants to lower rates on a group of articles, both for their own interests and that of their shippers, but is forbidden to do so because railroads in other parts of the country cannot afford it, or are for any other reason unwilling to do it, real uniformity of classification becomes impossible. Either there will be a set of commodity rates on so large a scale as to re-introduce, in a worse form, the very evil which the Commission is anxious to avoid, or there will be a set of rebates and other special reductions which will not only evade the purpose of the Commission in this matter, but at the same time defeat the most fundamental objects of the Interstate Commerce Law itself.

We believe that the increased difference between C. L. and L. C. L. rates, which has thus far accompanied the progress toward uniformity of classification, is no mere accident, but a necessity of the case. It is not confined to the United States, but has shown itself in still more marked form in Germany, where a higher degree of uniformity than ours has been secured only by means of even greater differences in favor of carloads. To encourage the former tendency and at the same time check the latter seems almost impossible. To prescribe uniformity of classification and then forbid specially low rates for carloads is, we believe, a task beyond the powers of the Interstate Commerce Commission.

#### The Baldwin Four-Cylinder Compound.

The Baldwin four-cylinder compound locomotive, given in this issue, deserves the attention of our readers for two reasons at least, one of which is the ingenuity and skill shown in the design, and the other the well-known reputation of the builders, who recommended this machine for general service, and particularly as a design most suitable for the transformation of the common types into compounds.

There are some features of this engine to which attention should be called. The starting valve is one of them, as it is in no way to be considered as an intercepting valve. Its action is not unlike the Lindner device, described in the *Railroad Gazette*, Nov. 15, 1889. Both of these devices admit live steam to the high-pressure cylinder, and wire-draw that steam to the low-pressure cylinder at starting. Both have the same pressure on the back side of the high-pressure piston as on the front side of the low-pressure; and what makes them even more alike is this: The Lindner device balances the high-pressure piston by permitting the wire-drawn steam which is necessarily on one side of that piston, to pass to the other side as well, when that other side is not in connection with live steam from the boiler, on account of the steam port on that end being covered by the lap of the valve. With the Baldwin device the same conditions are attained, except that the high-pressure piston does not have any pressure whatever on the back side unless there is boiler pressure upon the front side. That is, in starting a train the power is produced by a low-pressure cylinder using wire-drawn steam and a high-pressure cylinder having live steam on one side when the ports are opened, and when so opened there is always the same pressure of steam on the other side of the piston as is at that time being used in the low-pressure cylinder. In the case of the use of the intercepting valve, the low-pressure cylinder uses wire-drawn steam just the same, but the high-pressure cylinder is "intercepted" from such steam on its back side from the low-pressure cylinder.

If this locomotive starts trains satisfactorily without an intercepting valve, the old hue and cry against the starting of trains by the compound will again be



proved. In any case this feature of this design will be watched with interest.

From the general elevation of this locomotive it will be noticed that the Baldwin people have kept up their reputation for neat work. This engine, in spite of the compounding of the cylinders, and changes in the valve gear, is remarkably handsome. The front end has a simple appearance, that indicates but little increase of weight on the front truck. The fact is that the actual weight of the front end is the same as of other locomotives of the same general design.

The indicator cards show the valves to be quite well equalized, and in this respect satisfactory, the cut-off being as nearly equal on both ends of the cylinders as can be expected from a link motion slide valve engine.

The cards taken from the locomotive in service do not differ widely from the ideal cards at long cut-offs, viz., 1, 2, and 3, from which the engine was designed, the greatest difference being in the compression line. But in the case of No. 4 the difference is considerable in the point of exhaust closure and the compression line. In this compound, as in all others where the Stephenson link is used, the back pressure and compression in the high-pressure cylinder is inclined to be troublesome. However, in this case the action could be improved by increasing the inside clearance which is found to be but  $\frac{1}{4}$  in. on each side, reckoning from the edges of the packing rings.

The feature of this engine which has been most severely criticised is the crosshead connection. It is seldom that a piston rod on a large engine is out of centre with the connecting rod. In this case the distance between the centres is  $8\frac{1}{2}$  ins., but the two cylinders act as a balance to each other, and if the pressures in each were always in exact proportion to their areas there need be no apprehension that this arrangement would not work exactly as well as in any of the common forms of connection. What has been feared by some engineers who have expressed themselves on this subject is that the variation of pressure in the cylinders would cause a continual reversal of the preponderance of pressure from one piston rod to the other, and thereby cause breakage where the rods are joined to the crosshead. Reference to fig. 8 will show what is meant by this. The bending action that would result from unequal pressure on the two rods might cause, if of sufficient magnitude, cracks in the piston-rods.

Now, while such fears may be well grounded, if there were much inequality of pressure, yet there are other considerations than mere breakage to be taken into account, if there were such inequality of piston-rod pressure; for instance, the friction of the crosshead caused by the cramping in the guides as a result of the connecting rod being out of the centre with the cylinder. Such a design as this for a single cylinder engine of this capacity would be absurd, but with two pistons having nearly the same total pressure always, there is much reason for giving it a trial, because if no detrimental results arise therefrom the design is one for which we can promise, as far as the cylinder and piston arrangement are concerned, much general use. It has advantages not possessed by any other four-cylinder compound yet proposed and is, if durable, superior to cylinders in tandem. But upon this point we do not yet desire to give a decided opinion at the present time, preferring to let the results of the actual service in which the engine is engaged speak for the good and bad features of this element of the design.

However, in order that the conditions may be well understood, and that the actual amounts of the differences in pressure that occur during each stroke may be known, we have taken the trouble to analyze the reversals of pressure and the variation under several of the most unfavorable conditions of actual service, using the indicator diagrams as a basis for deduction. With some truth it might be stated that perhaps during the first few inches of the first stroke at starting there would be a difference greater than here shown, but as such difference only exists during a small fraction of the time during which such a locomotive would be in operation, and because the loss due to the increased friction of the crosshead during that time is too small to be worthy of consideration, we have not computed the difference of pressure at that time. For this investigation we have selected indicator cards Nos. 15, 17 and 18, as being representative cards in regard to speed, power and range of action. Besides, these cards were taken from the same end of both cylinders, and are therefore more comparable.

Figs. 1 and 2 show the analysis of card No. 15, figs. 3 and 4 that of card No. 17, and figs. 5 and 6 that of card 18. The lines *O P*, in figs. 1, 3 and 5, are the zero lines of pressure in those figures. The dotted lines *A B C D*, in figs. 1, 3 and 5, show the variation in

total pressure on the front side of the high-pressure piston during a whole revolution of the drivers. The dotted lines *E F G* in the same figures show the varia-

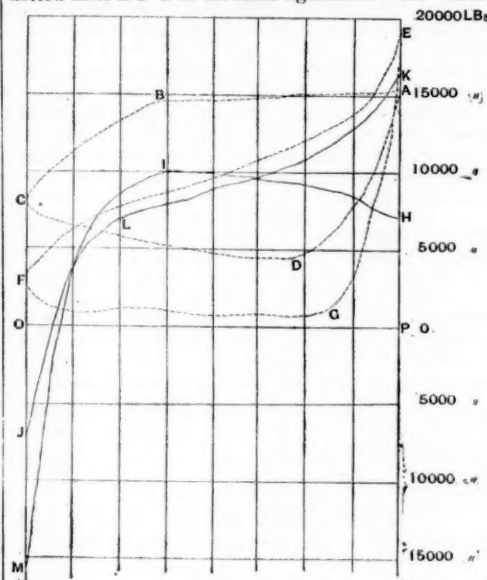


Fig. 1.

tion of total pressure on the front side of the low-pressure piston during the same revolution. The actual amount of the pressures is given by the figures on the sides of the diagrams.

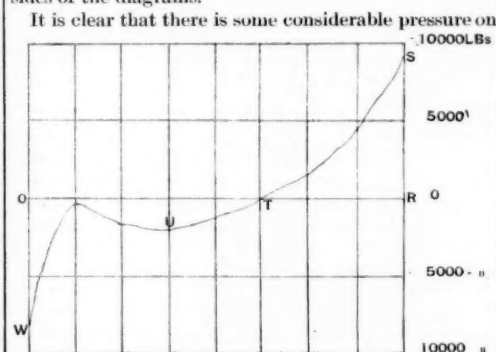


Fig. 2.

It is clear that there is some considerable pressure on the back of the piston also simultaneous with the total front pressures, and that these should be deducted before a comparison is made. Therefore, making these deductions, it is found that the lines *H I J* in figs. 1, 3 and 5

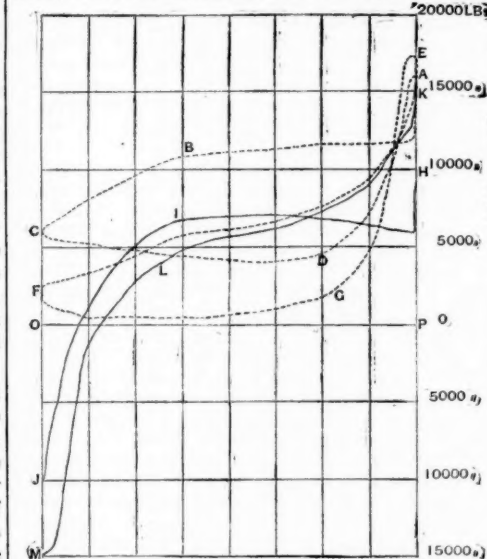


Fig. 3.

represent the variation in the actual pressure on the high-pressure piston rod during one stroke. Also the lines *K L M* indicate the actual pressures on the low-

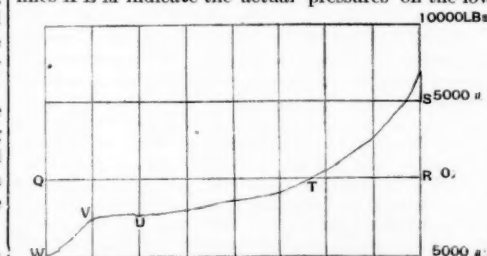


Fig. 4.

pressure piston rod. Thus graphically are shown the reversals of pressure, and the actual amounts, on the crossheads.

It can be seen from these figs. 1, 3 and 5, that there is considerable difference of pressure on the top and bottom lugs of the crosshead during each stroke; but this is more clearly seen from figs. 2, 4 and 6, which are constructed as follows: The line *R Q* is the zero line of pressures, and is taken as that on the high-pressure piston rod whatever it may be, at any portion

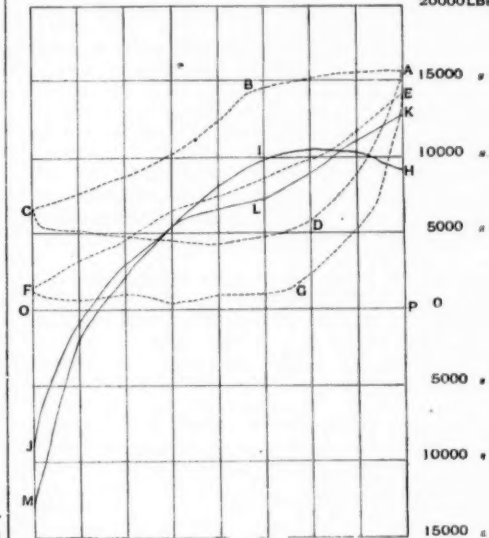


Fig. 5.

of the stroke. Above this line is measured the excess of pressure on the low-pressure piston rod, if there be any, and below is measured the deficiency of pressure on the low-pressure rod, if such deficiency exists. Therefore the lines *S T U V W* in figs. 2, 4 and 6 represent the excess or deficiency in actual amounts—given by the figures at the sides of the diagrams—of pressure on the low-pressure piston rod above and below that on the high-pressure piston rod

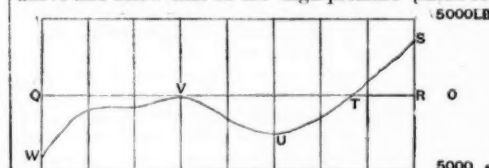


Fig. 6.

during each stroke at the cut-offs, and with the conditions under which cards 15, 17 and 18 were taken.

It will be noticed that the variation is greatest in the case of card No. 15, which is reasonable, as that card has a higher mean effective pressure than either 17 or 18, in the ratio of 70.5 and 27 to either 47 and 53.5 and 18.5. The maximum difference is about 9,000 lbs. for card 15, 7,000 lbs. for card 17, and but about 4,000 for card 18.

The reversal of pressure diagrams, figs. 2, 4 and 6, are not unlike in form. The maximum differences in pressure are at the ends of the stroke, where there is but little motion, and the minimum differences occur where there is the greatest rapidity of motion, i. e., about mid-stroke. This is a point of importance, and gives much reason for a belief in the efficiency of the design as far as the friction of the crosshead is concerned.

From the configuration of the curves one sees that there are in general two minimum and three maximum points of difference in pressures in each stroke, and that there is a reversal of preponderance of pressure several times during a revolution, and further that, owing to a difference in phase of pressure, there should be a slight "hump" in the diagram near the ends of the stroke, but this "hump" is so small and has so little bearing on the general proposition that we have not considered it here.

These diagrams are attractive, and one could study them with much profit, and not only with reference to the compound engine in question but also with reference to the varieties of pressure in single cylinder locomotives. Time and space forbids further analysis here, but at some future time when this crosshead construction either fails or proves itself efficient, we shall try to present other studies of this type of engine from the foregoing diagrams, and others that take into consideration combined effects not herein considered.

#### The Joint Committee's Bill of Lading.

Uniformity in bills of lading is a good thing. The more uniform they are, the better the relative position of carriers and shippers is defined; and, within pretty wide limits, it is more important to have the dividing line between the responsibilities of the two parties accurately settled than to have it based on grounds o

theoretical justice. Nor do we feel disposed to criticise very severely the actual form proposed. At the same time we are not sorry to see the date of its adoption postponed; for the matter deserves a great deal more discussion than it has actually had.

There is no doubt of the right of a railroad to adopt a form of bill of lading which shall greatly limit its common law liability. In this respect agreements with shippers with regard to freight are treated very differently from those which concern passengers. A road finds it very hard work to limit its responsibilities as a carrier of passengers by special contract. This is partly because the passenger cannot be assumed to have read the contract on his ticket, but still more because the prevention of accidents lies almost wholly within the province of the carrier, and is but slightly affected by the action of the passenger. A railroad accident, if caused by the company's negligence, is a public wrong; and the public cannot allow the company to shift responsibility by special agreements with its passengers, as if they, and they alone, were the persons interested.

With freight, the case is different. The shipper is supposed to have read his contract; it is his own fault if he does not. The railroad company cannot draw the contract in such a way as to relieve itself of the consequences of its own serious negligence; but it can throw upon the shipper the risk of those occurrences for which the company is not to blame any more than the shipper; and still more clearly those which are in any way the result of the shipper's own negligence. Common law is rather hard on the carrier in many of these respects; and a certain amount of relief seems desirable. The important thing is that such relief should not be made a means of doing the shipper injustice by the insertion of vexatious provisions.

From the multitude of points covered, we can select but a few for discussion.

"No carrier shall be liable for loss by riots, strikes, or stoppage of labor." The last phrase seems too general. Unless there was a strike, the courts would certainly not uphold the provision with regard to stoppage of labor. This being the case, it would seem better to leave it out. The document is too long as it stands; and a meaningless phrase can do nothing but make trouble. This criticism applies to a good many other paragraphs.

"No carrier shall be liable for damages from any cause," if it be necessary or usual to carry such property in open cars. This is too broad. There are many kinds of property—carriages, machinery, etc.—which are usually carried in open cars, but where it would be a real hardship to throw all responsibility upon the shipper; and where, in fact, no bill of lading would be allowed to have that effect.

The carrier, under the proposed form, may change route "in case of necessity." We have no great objection to this; only it is inconsistent with the idea of limiting as far as possible the responsibility of each carrier to its own line. We should prefer to see a reform which should at once give the receiving roads power to choose routes and impose upon them full responsibility to the shippers for the results of their action. This matter would be in still better shape if our trunk lines had an incorporated clearing house like that of England which should accept full responsibility on through shipments as a matter of course, and wholly relieve the shipper of the necessity of locating damages. In the case of such responsibility, selection of routes by the carrier would not be much of a hardship; and it might be made a means through which an association could avoid the evils of the anti-pooling clause of the Interstate Commerce Law.

Articles shipped without this bill of lading, under the Common Law liability, are to be rated one class higher than would otherwise be the case. This has been objected to in some quarters, but seems fair enough. If there is to be a uniform bill of lading, it is desirable that all shipments, as far as possible, should be made under its conditions. The added rate for shipments under exceptional liability is not to be regarded in the light of insurance against special risk, but as the cost of having business done in an unusual way. If the conditions of the bill of lading themselves are objectionable any such added cost is a hardship to the shipper; but if the document itself is a fair one, it is fair to require the public to conform to it, even by the imposition of penalties in excess of the actual risk.

#### The Union Pacific Report.

The financial results of the year's operations for the whole system, 5,180 miles, are as follows:

	1889	1888	Inc.
Gross earnings.....	\$31,070,182	\$30,195,523	\$874,659
Net earnings.....	11,195,971	10,460,635	735,337
Income from investments.....	812,954	807,466	5,488
Land sales.....	23,743	13,532	10,212
Total income.....	12,032,668	11,281,633	751,036
Interest on bonds.....	5,067,091	5,057,717	9,374
Other interest charges.....	1,893,926	1,629,896	264,031
Sinking fund.....	811,142	616,261	194,881
U. S. requirements.....	1,140,379	1,134,394	5,985
Discount, interest, etc.....	437,051	255,865	181,186
Land ex., Union div.....	64,936	70,408	5,472
Profit and loss.....	219,071	123,431	95,640
St. J. & G. I. deficit.....	69,003	140,917	71,915
O. R. & N. deficit.....	736,206	319,118	417,088
Central Pac deficit.....	280,377	342,019	61,641
Montana Un. 1/2 deficit.....	117,006	9,695	107,311
Kan. C. & Omaha deficit.....	46,576		46,576
Total expenditures.....	10,887,764	9,729,720	1,158,044
Balance.....	1,144,904	1,551,912	407,008
Earned on stock.....	1.88 pc.	2.55 pc.	*0.67 pc.

\*Decrease.

Neither the St. Joseph & Grand Island (446 miles) nor the Oregon Railway & Navigation (942 miles) is included in the above. The relative loss on the latter is greater than appears, because the usual expenditures for betterments were omitted, and a credit of \$127,000 for some reason substituted.

Apart from outside lines, profit and loss shows a gain of nearly \$100,000 over last year. Nearly all of this gain is on car service balances. On the other hand, it should be said that the amount of company's freight has diminished so much that the real gain in freight earnings is greater than the apparent gain. Detailed results for the whole system are as follows:

	1889.	1888.
Passenger, Commercial.....	\$6,772,363	\$6,857,100
Government.....	99,765	140,606
Freight, Commercial.....	20,966,341	20,322,774
Government.....	125,227	123,620
Company.....	507,325	630,951
Mail.....	928,666	921,841
Express.....	639,453	659,608
Car service.....	469,069	38,948
Rent of buildings.....	49,520	51,812
Miscellaneous.....	512,647	448,250
Total earnings.....	\$31,070,181	\$30,195,522
Expenses.....		
Conducting transportation.....	\$5,948,426	\$5,620,244
Motive power.....	6,519,405	6,597,121
Maintenance of cars.....	1,916,068	1,772,765
Maintenance of way.....	3,424,532	3,427,580
Renewal of rails.....	218,049	401,705
General expenses.....	565,018	653,700
Total expenses, excluding taxes.....	\$18,699,522	\$18,476,428
Surplus.....	\$12,370,658	\$11,719,094
Taxes.....	1,174,687	1,258,459

Net earnings, taxes deducted..... \$11,195,971 \$10,460,634

Miles operated (average)..... 5,162 5,011

The car service figures are gross, not balances. Balances were — \$202,000 in 1888 and — \$186,000 in 1889.

Statistics of operations are as follows:

	1889.	1888.
Passengers carried.....	3,684,000	3,349,000
Passenger mileage.....	292,000,000	287,000,000
Rate per passenger mile.....	2.352 cents.	2.440 cents.
Ton-mileage.....	1,672,000,000	1,683,000,000
Rate per ton-mile.....	1.336 cents.	1.305 cents.
Passenger train mileage.....	5,979,000	5,732,000
Average train-load, passengers.....	49	50
" earnings per pass. train-mile.....	\$1.411	\$1.497
Freight train mileage.....	9,850,000	10,275,000
Average load, tons.....	169.7	163.8
" earnings per freight train-mile.....	\$2.193	\$2.051

The most noticeable thing about these figures is the increase of the freight train load, more weight having been carried in fewer trains. On the lines of the Union Pacific proper this result was still more marked, the average load having increased from 188 to 203 tons.

The press dispatches concerning the threatened strikes among various classes of artisans and laborers which have been published during the past week have contained paragraphs referring to railroad employees nearly every day, but there is still very little definite news concerning negotiations with railroad officers, and there is no actual strike at any point. The officers of the Union Pacific have held a protracted conference with trainmen at Cheyenne, and it is said that an increase of wages was granted to those on the eastern division. Some trainmen of the Indiana Midland, who struck a month ago for three or four months' back pay, have received their money, and now some of the sectionmen have struck because they were not also paid. The Brotherhood of Locomotive Engineers have held a number of largely attended meetings at various points, but, as usual, they do not divulge their doings. An Indianapolis newspaper is authority for the statement that the discharged passenger conductors of the Pennsylvania lines employed a detective, who in their interest discovered that a former traveling salesman, who had been thrown out of work, was the cause of their dismissal. After conferring with the officers of the road "he had been around on the various divisions and secured rides by working on the conductors' sympathies." The yardmen at Pittsburgh have taken no action on an offer of increased pay made by the railroads, but have referred it to the "Supreme Council," which is composed of 12 men—three each of the grand officers of the Brotherhood of Locomotive Firemen, Brotherhood of Railway Trainmen, Brotherhood of Railway Conductors, and Switchmen's Mutual Aid Association, which organizations together constitute the "United Order of Railway Employees." The members of the Supreme Council are F. P. Sargent, President; John Sweeney, W. A. Sheahan, E. M. Debs, G. W. Howard, John Downey, S. E. Wilkinson and six others. It appears, however, that the Baltimore & Ohio has granted the demands of its yard trainmen at Pittsburgh, giving the day conductors \$2.75 and night conductors \$2.90. The day brakemen will be paid \$2.50 and the night men \$2.70, 10 hours to constitute a day's work. The tenor of the dispatches indicates that this has been accepted. On the Great Southern & Western Railway of Ireland passenger trains, and even mail trains, were badly delayed on Sunday last by a strike of the employees, among which were signalmen. The trains for several days had to be run by "clerks" (station employees). The railroad prosecuted some of the signalmen for leaving work without notice. The dispatches state that one of them was fined £10, and that the cases against six others were withdrawn.

National legislation on automatic brakes and couplers again seems probable. The Flower bill has lately been up before the House Committee on Railroads and Canals,

This bill provides that all engines and freight cars in the United States shall be equipped after Nov. 1, 1892, with automatic couplers and automatic air brakes. The bill seems to carry with it the elements of its own defeat. The power of Congress to compel the use of these appliances on engines and cars running within state limits will be questioned, and it would be impossible to equip the stock by Nov. 1, 1892. If the bill means that equipment shall begin after Nov. 1, 1892, it means nothing. Mr. Henderson, of Iowa, has introduced into the House a bill practically identical with that enacted in Iowa this year, and Mr. Allison has introduced the same bill in the Senate. Mr. Coffin has appeared before the committees in support of this bill. It embodies, of course, the results of the long and careful study that Mr. Coffin has given to the subject, and is as simple and moderate as could be expected. Its provisions apply to rolling stock used in interstate commerce. They are:

New cars, cars shipped for general repairs and cars requiring new drawbars shall be equipped with "safety automatic couplers."

By Jan. 1, 1895, all freight and passenger cars used in interstate commerce or in the construction of any interstate railroad must be equipped with "safety automatic couplers."

By Jan. 1, 1892, all locomotives must be equipped with driver brakes.

After Jan. 1, 1893, it shall be unlawful to run any train that has not enough cars in it equipped with power or automatic brakes to enable the engineer to control the train.

Violation of the provisions of this law is made a misdemeanor subject to a fine of not less than \$500, and railroad companies are liable in civil damages for any injury to employees, provided there were in use at the time and place the injury was inflicted any car not equipped with automatic couplers and brakes.

The companies are required to report annually, under oath, the number of cars used in interstate commerce and the number of cars and engines equipped as provided in the act.

After a railroad company has its rolling stock equipped in accordance with the provisions of the act, it may lawfully refuse to receive from other companies cars that are not so equipped.

Probably it would not be beyond the capacity of the manufacturers to supply the material necessary to comply with this bill, while it would be impossible to furnish that required by the Flower bill. Moreover, the choice of brakes and couplers is left so unrestricted that there can be no complaint of monopoly. The last dispatches indicate that Senator Cullom will introduce a bill to appoint a commission to prepare a draft of a bill. If this is done the Coffin bill may be defeated in the Senate.

The advantage and economy of avoiding delays in the movement of trains are becoming better appreciated in railroad management. This is owing not only to the necessity for making the fast time in competition, but also to the fact that a train is earning money only when moving; and with every delay even of a few minutes there is a fixed expenditure which still goes on and the rolling stock is prevented from making as much mileage as it otherwise would. In consequence, we not only see more attention paid to making up trains, so that there shall be no delay in transit on account of switching cars in or out or from similar causes, but even the smaller necessary detentions are being looked after. The track tank water system is increasing in use, and we have recently noticed on one line action being taken to the same end as regards the water supply, but in an entirely different manner. In order to fill the engine tanks with as little delay as possible, the water tanks along the line when rebuilt are elevated materially above their former height. Though this involves considerable expense, the saving in time, though but a few minutes to each train, is considered enough to compensate for it. The increased pressure also allows trains of stock to be watered in less time in summer weather. Improvements in coaling stations are being made, so that an engine seems hardly to have stopped with its train before the tender has been replenished and the journey is resumed. The use of block signals; thus preventing delays for train orders, additional second and third tracks, more frequent side and passing tracks, and adequate motive power are all receiving especial attention at the present time, with a view to shorten even the smaller delays.

The situation in the Mississippi Valley has grown worse at many points during the past week. A strong east wind drove the water from the Gulf over the Louisville & Nashville track east of New Orleans, so that for a time all the roads entering that city from the north and east were blocked. This lasted only a day or two, however, and at last accounts the water in the river was falling, and it was believed that the worst was past. In Pointe Coupee Parish last week property worth several hundred thousand dollars was destroyed, and the Texas & Pacific track was overflowed. The unfinished line of the New Orleans & Northwestern was damaged in Concordia Parish. The bridge of the Louisiana Central road, at Barrows, was dislodged and jammed against the Texas & Pacific Bridge at Grosse Tete. Rain fell in Texas for three days last week, and much damage was done in many places in the northern and western sections of the State. Railroad tracks were overflowed and trains blockaded in scores of places. The Peas River bridge, near Vernon, on the Denver, Texas & Gulf, was wrecked, and 500 ft. of its iron spans and 12 bents of its trestlework approaches were swept down. At Overbrook, on the Gulf, Colorado & Santa Fé,



in the Indian Territory, a large bridge was washed away, and another at Marietta, on the same road, has been carried down. Several hundred feet of the approach to the Santa Fé bridge across the Red River has been washed out, and other damage has been done to the road both north and south of Red River. A half-mile wash-out occurred on the Missouri, Kansas & Texas at Lindsey, and a 90 ft. bridge over Montague Creek was swept away.

#### American Practice in Block Signaling.

##### I.

In the papers which follow we purpose to give a brief and simple, yet full, description of the methods of block signaling now in use in this country. While the papers will not be exhaustive as to mechanical details, they will summarize the salient features of each system, giving such facts concerning cost and the degree of satisfaction with which it is used as are available, and making possible some comparisons between the different systems.

There are practically two systems of block signaling, of which we may call the first the simple block system. Assuming that every railroad is properly supplied with telegraph offices, this may be said to be merely a code of rules by which the attendant at a given station exhibits a signal to hold all trains moving in a certain direction until he receives word by electrical communication that the last preceding train has reached another station and gone out of the section of track intended to be protected. This is an absolute block system. When the regulations permit a second train to be sent over the road before the first one has gone out of the block section, but under instructions to run slowly, the term "permissive blocking" is used. The signals by which trains are admitted to the sections under a block system may be electrically connected with each other and locked by the Sykes system, so that when an operator, after admitting a train to a section, puts his signal to danger, the lever of the signal is automatically locked, so that the signal cannot again be lowered (placed in the safety position) for another train until the train first mentioned has actually reached the next station and operated an electro-magnet. When signals are fitted with these locks permissive blocking is impracticable, unless (1) the operator disconnects the wires by which the Sykes locks control the signal levers, or (2) the signal is left in the danger position, and engineers are instructed by flag, lamp, or hand signal to proceed regardless of the regular signal. In either case the safeguard provided by the locks becomes inoperative, as, when two trains are in a section, the first one passing out releases the signal so that a third may be admitted, while the second may be indefinitely detained within the section.

The second system is the automatic. In this no attendant is provided, but each signal stands ordinarily at "all clear" to admit a train to its section. The train on entering sets the signal at danger by the operation of an electric circuit, actuated by the passage of the wheels, and resets the signal at "clear" when it emerges from the section. The first automatic signal was the Hall, which was used in Massachusetts and Connecticut about 1871. In this the electric communication from one station to another is by means of a line wire hung upon poles. Some eight or nine years later the track circuit system was introduced. In this the electric circuit is conducted from one end of a block section to the other through the rails of the track, and the proper working of the system depends upon the integrity of this circuit. The presence in the section of even a single pair of iron wheels connected together by an iron axle allows the passage of the electric current from one rail to the other, and withdraws from the signal box the force that holds the signal at "clear." If a train breaks apart, the exit of a portion of it from the block section does not clear the signal at the entrance, as is the case with a simple line-wire system.

The most common form of track circuit signal is that in which the signal consists of a disc operated by clock-work, the latter being controlled by the electric current. In the pneumatic track circuit system the signal consists of a semaphore operated by compressed air, which is controlled by the electric circuit.

#### THE SIMPLE BLOCK SYSTEM.

The most extensive block system in this country is that of the Pennsylvania Railroad, which is substantially the same as that in use on the great majority of the railroads of Great Britain, though there are numerous differences in the detail of operation. The Pennsylvania uses the simple block system (without Sykes locks). When the system was introduced the number of trains had already grown so large that it became necessary, in order to accommodate them, to establish stations especially for signaling, the regular stations being too far apart. These intermediate stations are generally two-story buildings, and are termed "towers," and these buildings, being characteristic of the system, have come to be regarded by many people as an essential part of it; but, in point of fact, many of the block signal operators are located in ordinary station offices. On those sections of the Pennsylvania where trains are most frequent the block sections are from one to two miles apart. Near large terminal stations the intervals are in many cases considerably less than a mile. Regular telegraph stations are used where-

ever possible, but the larger stations have to have two telegraph offices, one for block signaling and one for ordinary business. Special stations are established between the regular stations at such points as will best divide the space and maintain an approximately uniform length of block. On portions of the road where trains are less frequent the sections are made longer, in some cases four or five miles. Each station has a fixed signal. This consists of a semaphore with a single light, which shows red when the arm of the semaphore is at "danger" (horizontal) and white when the arm of the semaphore is dropped, to indicate "all clear." There is a separate semaphore arm for each track, but the eastbound and westbound arms are generally placed on one post, and a single lamp answers for both. The older form of signal was a disc, but these are being gradually displaced by the semaphore, which is now standard. The electrical apparatus consists simply of a Morse telegraph line, with the usual instruments. On the passage of a train the operator places the signal at danger to stop following trains and reports the time to the station which the train last passed and to that toward which it is proceeding.

**Summary of Pennsylvania Rules.**—A block section is called a "block." Trains will be governed absolutely by fixed signals and will not observe the time-space rule. The old form signal has a green disc, to indicate caution. With semaphores a position midway between horizontal and the nearly vertical position is employed to indicate caution. These cautionary indications are of course used only in permissive blocking. The signal normally stands at danger. After being changed for a train, it must be returned to danger as soon as the whole of the train has passed the signal. A train must not be backed after stopping at a block station. In case of failure of wires or the operator for any reason cannot get orders for a train, he must give it written notice of the reason for the proper signal not being displayed. Trains must not be admitted to a block section under the permissive system to follow a passenger train, and a passenger train must not be admitted to follow permissively any train until it is first stopped and notified that there is a train ahead. Exceptions are, however, made to the last paragraph. A train intending to use a crossover between the block stations must notify the operator. A train must not be reported as having passed until the rear end has got 300 ft. beyond the signal. Trainmen are not relieved from observing all ordinary rules in regard to the protection of their train.

The customary place for the signal is immediately opposite the telegraph office. Where this is at a passenger station, inconvenience sometimes results from the fact that the train held by the signal is not in a convenient position for discharging and loading passengers. To provide against this the station should be equipped with two signals, a "home" and a "starting," the former to stop trains before they reach the station, and the latter to hold trains which are standing at the station. By this means, if the block section in advance is occupied, a train may be safely admitted to the station while yet it is kept under control, so that it cannot leave without the permission of the operator. If a train is detained at the station, the following train need not be held back at the entrance of the next preceding block, one, two or more miles away, but may be allowed to come up to the home signal, whence it can proceed without delay to the platform as soon as the one in advance has made way for it.

A danger in signaling is the possibility of trains entering the main track from a siding or at a crossover track midway of the section without the knowledge of the operator at the entrance to the section. To provide against this, all switches connecting with such sidings or crossovers should be under the control of the operator. This may be effected by an electro-magnetic lock, so arranged that it cannot be released except from the operator's office, the latter being connected with the switch by wire; or an ordinary switch may be locked by a special key, which must be obtained from the block signal operator. Neither of these systems is used to any extent in the United States. The regulations of the Pennsylvania, as noted above, require simply that a conductor intending to turn a switch between two block stations for the purpose of using another main track than that on which he belongs must notify the block operator beforehand, and get his acknowledgment, with authority to so use the track. In view of the difficulty of controlling these outlying switches satisfactorily, an essential point in preparing a road for operation under a block system is the lengthening and alteration of side tracks, so that as many as possible of such tracks shall connect with the main track at a station—that is, between two signals, a home and a starting signal, which are controlled and handled by the same operator.

A train must, of course, never pass a block signal until its indication is absolutely known. When there is a fog or a driving snowstorm, or the signal is obscured by steam from a locomotive or any other cause, a fast train approaching a block station must be slackened in order to permit the engineer to make sure of the indication of the signal before it is too late for him to stop. The annoyance from numerous delays to fast trains from this cause has led to the introduction of cautionary signals, erected at a distance from the home signal, and indicating the position of the latter. Home and distant signals generally differ in color and the end of the distant is notched. Customarily the positive signal blade is painted red and the cautionary green. The light on the cautionary signal is made to indicate green for caution and white for "all clear." The cautionary signals are erected at from 1,000 to 2,000 ft. from the home signal. If an approaching en-

gineman finds one of them in the "all clear" position, he knows that the home signal has been pulled to "all clear," and that he need not expect to be stopped at that signal. This distant (cautionary) signal must of course be interlocked with the home (positive) signal so that it can never by mistake be pulled to safety until the positive signal has actually been so pulled.

Illuminated blades, which are extensively used for switch signals in yards (for movements other than those of fast trains on main tracks), have been used to a limited extent for fast-route signals, and are equally applicable to the block system. The term "illuminated blade" means a blade in connection with which a lamp (hidden from the engineer) is attached to the post in such a position that it throws light directly on the face of the blade. The engineman can thus see its position at night the same as in the day-time, and a signal lamp is unnecessary. Illuminated blades are prescribed for all new work on the Pennsylvania lines west of Pittsburgh, and the standard color of blades there is yellow. By this means the colored indication can be entirely discarded.

The painting of arms yellow (or other neutral color) is a step in the right direction, as there is an inconsistency in painting the face of a semaphore arm white or red, because it must indicate, when horizontal, the opposite of white, and when down the opposite of red. Green gives a wrong indication when the arm is either up or down.

The chief fault found with illuminated blades is the difficulty of providing a lamp which will light them up sufficiently to make them visible at the proper distance. To overcome this the Union Switch & Signal Co. has introduced a blade carrying a reflecting surface of silvered glass. Koyl's parabolic semaphore, manufactured by the National Switch & Signal Co., consists of a semaphore arm made on the lines of a section of a parabola, so as to more efficiently reflect the rays of light in parallel lines. Both these signals may or may not be arranged so as to throw a red light upon the blade when it is in the horizontal position, and a white light when it is pulled down. These devices are familiar to those who have followed the progress of the art in the columns of the *Railroad Gazette*.

**Cost of Maintenance.**—The principal item of cost is, of course, the wages of operators and inspectors, to which is to be added the maintenance of buildings, with fuel and lights, where a building is erected especially for this service. At stations where operators have no switches to attend to, and no other work of any kind, they work 12 hours each per day, seven days in the week. The pay of these men is from \$45 to \$55 per month each. Where the duties are more complex the pay is higher, and where a considerable number of interlocking switches are operated the working time for each man is eight hours daily. The men at these important towers are paid, on the Pennsylvania, from \$50 to \$70 per month. On the New York, Lake Erie & Western some of the operators, who work 12 hours daily, alternate between day and night work weekly. The duties of the inspectors are light, so far as simple block stations are concerned. Their work is chiefly in connection with interlocking towers, which at all important stations are operated, as intimated above, by the same man who attends to the block signaling, and the time spent inspecting simple block stations is treated as a secondary matter. For more detailed estimates of expense the reader is referred to a subsequent chapter on the Sykes system. As in the system here described, the cost of inspection is but a very small fraction of the total expense, and as the latter must depend upon conditions which must be calculated in each case by itself, further consideration of the subject here is unnecessary. A recent estimate on a prominent road showed that 100 miles of its line could be worked under the block system, with block sections four miles long, by the erection of only three towers between regular stations. When it is considered that trains running at 40 miles an hour and on 10-minute intervals are 6½ miles apart, the possibilities of the block system will be readily recognized.

The West Shore, the Chicago, Burlington & Quincy, and the New York, Lake Erie & Western are the principal roads, outside those controlled by the Pennsylvania, which use the block system as above described. Others use it on very short sections of road or for only a portion of the trains. It is scarcely necessary to say that this system has given full satisfaction wherever used. No officer on a road using it ever thought of abolishing it or of diminishing its use in any way. Operators have admitted a train to a section when it was not clear, and engineers have disregarded danger signals, causing collisions; but the excellent record on the Pennsylvania, where the system has been in operation on 500 miles of double track for over ten years, shows that these defects of discipline are not to be regarded as incurable. The first step toward abating them by mechanical means is the adoption of the Sykes system, which we shall next consider.

#### NEW PUBLICATIONS.

*Revised Pocket Geologist and Mineralogist; or, Sixteen Chapters on Coals, Oils, Ores and other Minerals, for Practical People.* By Frank H. Smith, Engineer and Geologist, Baltimore, Md. Price \$1.

This pocketbook is a revision and combination of the *Pocket Geologist* published in 1877, and *Rocks, Minerals and Stocks*, published in 1882, by the same author. The



design of this little book is to give a brief and simple description of all the rocks and minerals with which the practical man can have any possible concern. A good deal of science is condensed into very small compass.

*Proceedings of the Engineers' Club of Philadelphia.* Vol. VII., No. 3. Howard Murphy, Secretary, 122 Girard Street, Philadelphia, Pa.

This number contains a paper on Interlocking Switches and Signals, by Mr. Henry M. Sperry, Supervisor of Signals, New York Division Pennsylvania Railroad; also a paper on the Improvement of the Bar at the Entrance to the Rio Grande do Sul, Brazil, by Prof. L. M. Haupt, and a number of other papers of considerable importance.

*Stevens Indicator.* April, 1890. Stevens Institute of Technology, Hoboken, N. J.

This issue of the *Indicator* has a very interesting table of contents. The longest paper is on the Ventilation of Buildings, by Mr. A. R. Wolff. This paper has been reprinted by the author, and may be obtained from him at No. 315 Potter Building, New York City. It is an elaborate and careful theoretical study of the subject. Other papers are: Notes on the Action of Lubricants, by Prof. Denton; Hydraulic Lever Testing Machines, by D. C. Henning; Cable Traction Applied to Elevated Railroads, by C. W. Thomas; Eriesson and his Monitor, by Prof. C. W. McCord; and Cost of Lubricating Car Journals, by L. S. Randolph. The last two are reprints of papers already published. In fact, the great part of Mr. Randolph's paper was published in the *Railroad Gazette* some months ago.

*Merriman's Roofs and Bridges.*—Messrs. John Wiley & Sons have issued a second edition of Part I. of Professor Merriman's admirable work on Roofs and Bridges. This part deals with Stresses in Simple Trusses. A number of typographical errors have been corrected, and in an appendix are given answers to problems appearing in the body of the work. These were not in the first edition.

*Locomotive Engine Running and Management: A Treatise on Locomotive Engines, showing how to manage Locomotives in Running, etc., etc.* By Angus Sinclair. Fourteenth edition, revised and enlarged. New York: John Wiley & Sons, 1890. Price \$2.

Mr. Sinclair's valuable little book is now so well known that it would be superfluous to say more than to mention the fact of the appearance of the fourteenth edition. In his preface the author says that he has endeavored in this last edition to bring it up to the requirements of the most recent practice, and that this has called for radical changes in the book. "A considerable quantity of what was regarded as unimportant matter has been eliminated, and the writer has striven to present in the revised edition only such information as all intelligent enginemen ought to be familiar with."

*Engineering News Atlas of Railway Progress, 1889 and 1890.* Engineering News Publishing Co., New York City. —This is the second annual edition of a collection of maps showing railroad construction in various years. It contains the construction maps published in *Engineering News* during the year, as well as other maps of considerable interest. A list of chief engineers of railroads is given, and a classified list of contractors. In the same volume are given a number of the more important illustrations and articles published in that journal during the year, aside from those bearing particularly on railroad construction.

*The Roadmaster and Foreman.*—The *Railway Section Foreman* has been reorganized and it now appears under the above name. Its headquarters are now in Chicago, and its editor is F. A. Smith. The paper has been enlarged and improved, and the March and April issues each contain a good variety of illustrated and other articles of interest to all classes of men in the railway department. A list of contributors, who will write special articles for the paper during the coming year is printed, among the names appearing in it being D. H. Lovell, H. W. Reed, William Barclay Parsons, J. S. Lane, J. W. Craig and J. B. Morford.

#### LOCOMOTIVE BUILDING.

The Chicago, St. Paul & Kansas City will soon award contracts for building 25 locomotive tenders. The bids have been submitted, and are now under consideration.

H. K. Porter & Co., of Pittsburgh, have finished two locomotives for use in coal mines. One of the engines is for a West Virginia mine, and weighs five tons, and is five feet high. The other will be sent to Pocahontas, Va. It weighs 16 tons, and is six feet high. A mogul engine has also been completed for a 30-in. gauge road in Cuba.

The Central of Georgia has received the first five of the order for 40 new locomotives referred to recently. Fifteen more will be delivered by May 17. The order includes 30 freight engines, six passenger engines and four switching engines. Sixteen of the freight engines will have 18 × 24-in. cylinders and fourteen 19 × 24 cylinders. Four of the passenger engines will have 18 × 24 cylinders and two 17 × 24 cylinders. The four switching engines have 18 × 24 cylinders. All the engines are being built by the Baldwin Locomotive Works.

The Union Pacific this week let the contracts for building 131 locomotives, 15 of which are to be six-wheeled, 11 eight-wheeled, 16 narrow gauge consolidation and 89 ten wheelers. Of this order 71 locomotives go to the Rhode Island Locomotive Works, 31 to the Baldwin Locomotive Works and 29 to the Cooke Locomotive Co.

So many reports are printed stating that the Baltimore & Ohio has largely increased the force at the Mount Clare shops recently, and that the company in-

tends to resume the building of new locomotives on a large scale, that it may be well to state that the company has made no additions to the force at Mount Clare. Of course the road does a large amount of repairing, and consequently keeps a large force of men employed. In order to provide employment for the men when work is light it will build probably from five to ten locomotives a year. This year there will probably be built 10 heavy switching engines.

The Schenectady Locomotive Works, at Schenectady, N. Y., built 27 locomotives in April. The orders included: Six 8-wheel passenger engines 19 × 24-in. cylinders; 13 10-wheeled freight engines with 19 × 24-in. cylinders to the Chicago & Northwestern, and also 4 6-wheeled switching engines with 17 × 24-in. cylinders; one 18 × 24 passenger engine to the Hutchinson & Southern; one 6-wheeled switching engine with 17 × 24-in. cylinders to the Louisville, St. Louis & Texas, and 2 narrow gauge switching engines with 9 × 16-in. cylinders for the Troy Steel & Iron Co.

The order for five passenger engines placed some months ago with the Pittsburgh Locomotive Works by the St. Louis, Vandalia & Terre Haute road, has been completed.

The Savannah, Florida & Western has just received five ten-wheel freight locomotives from the Baldwin Locomotive Works.

The Baldwin Locomotive Works have an order for switching engines for Al. Right & Co., of Buffalo.

The Schenectady Locomotive Works have been awarded the contract for building the 15 locomotives for the Louisville, New Orleans & Texas, referred to last week.

#### CAR BUILDING.

The Central Vermont is in the market for 500 cars.

The New York & New England will also soon place orders for 500 cars.

The Cincinnati, New Orleans & Texas Pacific has ordered 140 platform cars of the Elliott Car Works, Gadsden, Ala.

The Louisville & Nashville received eight new engines for the Alabama division this week.

The Central of Georgia is building four passenger cars at its shops at Macon, Ga.

The Wagner Palace Car Co. is building at its Buffalo shops the cars for three new vestibule trains to be run between Chicago and New York by the Michigan Central. Eight parlor cars are also being built at these shops for the Central Vermont.

The St. Charles Car Co., of St. Charles, Mo., has finished a new private car for the General Manager of the Rio Grande Western. It is 65 ft. long.

The Union Pacific is in the market for about 3,000 cars, and the order will probably be placed within a few days. It is understood that the order will include 1,000 box, 400 stock, 650 coal, 450 furniture and 300 fruit cars; also 60 caboceros and six new chair cars and a similar number of baggage cars.

The Long Island road is having two drawing-room cars, two passenger cars and two combination cars built at the Pullman Car Works.

The Ohio Falls Car Co., of Jeffersonville, Ind., is building six passenger and two baggage cars for the Columbus, Shawnee & Hocking Valley.

The Ensign Car Co., of Huntington, W. Va., has under contract 1,000 cattle cars for the Canda Cattle Car Co., and 300 box cars for the Cleveland, Cincinnati, Chicago & St. Louis.

The Lehigh Valley has now under contract and construction the following cars: 1,500 box cars of 50,000 lbs. capacity by McKee, Fuller & Co., Catasauqua, Pa., and 500 of the same style of cars by the Jackson & Woodin Mfg. Co., Berwick, Pa. The company is also building 300 box, 200 refrigerator and 200 flat bottom gondolas at its own shops. The company will not at present contract for any other new cars.

The Missouri Car & Foundry Co., of St. Louis, is to increase its capital stock from \$600,000 to \$750,000.

The Union Pacific has placed four new postal cars in the fast mail service. Two other postal cars are under construction.

The Pittsburgh papers quote President C. S. Millard, of the Indianapolis Car & Manufacturing Co., as stating that orders had been recently given by the Missouri Pacific for 3,000 cars; by the Pennsylvania lines west of Pittsburgh for 10,000; by the Columbus, Hocking Valley & Toledo, 2,000; Cleveland, Cincinnati, Chicago & St. Louis, 2,000; and the Baltimore & Ohio, 4,000. It is quite evident that the reporters must have misunderstood Mr. Millard.

The Pennsylvania, Poughkeepsie & Boston has received eight new passenger cars from the Pullman Car Co.

The Atlanta & Florida has recently received a number of passenger cars from the Jackson & Sharp Co., of Wilmington, Del.

The Harvey Steel Co. was incorporated in Illinois this week with a capital stock of \$1,000,000, by T. W. Harvey, G. L. Harvey, and A. M. Turner.

The Alabama Midland has purchased of the New York Equipment Co. fifty 25-ton ventilated fruit cars, 150 platform cars, and a number of box cars, the whole lot to cost \$56,000. The cars will be built by the United States Rolling Stock Co. at the Anniston and Decatur works.

The Basic City Car Works Co. has been recently organized to build car works at Basic City, Va. W. S. Gooch, of Roanoke, is President; James Bumgardner, of Staunton, Vice-President; M. A. Booker, of Staunton, Secretary and Treasurer. The contract for its buildings has been let to Lushbaugh Bros., of Staunton. These works will employ about 300 hands, and will have a capacity of seven cars per day.

#### BRIDGE BUILDING.

Augusta, Ga.—The North Augusta Land Co. has been organized by M. J. Verdery, of New York City; W. H. Cozart, of Augusta, and others. Among its projects is the proposed bridge across the Savannah River at Augusta, which has already been referred to. The bridge will be built from Carolina Heights, at the foot of Kollock street, and will have a carriage way and street car tracks.

Baltimore County, Md.—Wm. H. Shipley, Bridge Superintendent of Baltimore County, Md., has reported to the County Commissioners that it will require \$6,700 to build the proposed new bridges and to repair the old ones during the year 1890.

Brockville, Ont.—The Brockville & New York Bridge Co. has been formed to build the proposed bridge over the St. Lawrence River at Brockville which is projected by the Brockville, Westport & Sault Ste. Marie Railroad. The structure will be a low bridge about 4,687 ft. long and with 19 spans ranging in length from 150 ft. to 525 ft. The latter span will be a cantilever over the middle channel. It will be a swing span, as will also the two of the 150-ft. spans.

Buckland, Mass.—The town is to build a new bridge at Shelburne Falls jointly with the town of Shelburne.

Buena Vista, Va.—The Rockbridge County Commissioners will erect an iron bridge over South River, near Buena Vista Furnace, and have asked for proposals.

Chester, Md.—The stockholders of the Chester Bridge Co. have agreed to a sale of the bridge to Kent and Queen Anne counties for \$11,400, for the purpose of making it a free bridge.

Dingman's Ferry, Pa.—J. N. Miller, of Centreville, is interested in a company which has been organized to build an iron bridge over the Delaware River at this point. It will be about 530 ft. long, and the cost is estimated at \$15,000, of which \$5,000 will be for the masonry work.

East St. Louis, Ill.—The abutments for the bridge at this point have been nearly completed and the work on the iron superstructure has been commenced.

East Toledo, O.—The Toledo, Columbus & Cincinnati proposes to build a bridge across the tracks of the Lake Shore & Michigan Southern at this point.

Edna, Tex.—An iron bridge is to be built over the Navidad River at Edna, at a cost of \$7,700, for which the Pittsburgh Bridge Co. has the contract.

Florence, Ala.—The iron work for the drawbridge to be erected over the Tennessee River at Florence is being finished at the Shelby Iron Works at Shelby, Ala. The draw will be 412 ft. long. The structure will probably be completed by July 1.

Fort Coulonge, Que.—The report of the survey and plans made for an intercolonial bridge over the Ottawa River between La Poudre, in Renfrew County, Ont., and Fort Coulonge, in Pontiac County, Que., was laid before the Dominion House of Commons last week. The bridge recommended will be about 1,735 ft. long, with nine Howe trusses of 150 ft. clear span resting on piers 15 × 20 ft. at the top, and one swing span resting on a pier 20 × 20 ft. at the top. The two trestle approaches will be 58 and 78 ft. long, with a clear width of 17 ft. over the whole distance. The bridge will be 9 ft. high above extreme high water and 16½ ft. above low water. The total cost is estimated at: Piers, \$26,000; superstructure, \$28,000, and superintendence, \$6,000; total, \$60,000.

Goshen Bridge, Va.—The commissioners of Rockbridge County have asked bids for an iron bridge to be built over the river at this point.

Hancock, N. Y.—The iron bridge of the Ontario, Carbondale & Scranton over the Delaware River at Hancock has been completed. The bridge is 70 ft. above low water and over 700 ft. long. An iron bridge at Fall Brook will also be completed shortly.

Intercolonial Railroad.—Tenders have been asked for the construction of 11 pairs of steel plate girders for deck bridges of 40 ft. clear span. Proposals will be received until May 17 by D. Pottinger, of Moncton, N. B., Chief Superintendent.

Montreal, Que.—The stockholders of the Montreal Bridge Co. have elected the following provisional officers: Henry Hogan, Vice-President; Hon. J. Thibault, Vice-President; C. N. Armstrong, Managing Director; Robert Watson, Secretary.

Mount Vernon, O.—The County Commissioners have condemned the bridge at the west end of High street, and may erect a new structure in its place.

New Britain, Conn.—The estimates of the cost of the proposed bridge at Chestnut street is placed at \$24,550, exclusive of land damages, by an engineer of the New York, New Haven & Hartford. It was expected that the cost of the bridge would be much smaller, and it may now be decided not to build it.

Newton, Mass.—It is proposed to build a new Bridge over the Charles River from Watertown to Newton.

Philadelphia.—Cofrode & Saylor have about finished the iron superstructure for the plate girder bridge across the Schuylkill River, below the mouth of the Wissahicon River, and which is known as City Avenue Bridge.

The Philadelphia & Pading has completed the deck plate girder bridge at the Falls of Schuylkill, Philadelphia. The bridge is 675 ft. long, and has eight spans. There is also a stone arch with an 80-ft. clear span in Fairmount Park. The bridge was built by the Pencoyd Iron Works.

New York City.—The bill providing for the construction of a bridge over the Harlem River at Seventh Avenue, New York City, at a cost of \$1,250,000, has become a law.

New York State.—The State Engineer and the Superintendent of Public Works have a report in answer to the State Senate resolution, requesting them to state what new canal bridges are necessary. The report advises the following work: that the swing bridge at Lawrence street in Albany be repaired; the lift bridge at West Troy should be replaced by a new structure. A new bridge is advised at Church street in Schenectady, at the expense of those interested; at Bridge street, Amsterdam; at Main street, Fultonville; at Ship street, Cohoes; at East street, Fort Edward; at farm crossing of S. C. Rathbone, in town of Whitely, on the Champlain canal.

Pickens C. H., S. C.—On May 8 the Commissioners of Pickens and Oconee counties, S. C., will open bids for the construction of a bridge, over the Keowee River, at Pickens C. H.

Ponca, Neb.—Application will soon be made to the Secretary of War for authorization to build a low bridge across the Missouri River at Ponca, instead of the high bridge, as provided by the present charter.

St. Charles Railroad Bridge.—All the piers and masonry in connection with the St. Charles Railroad bridge in Quebec are now completed. The river is still so full of ice that the trestle work on the east side cannot be continued at present. The iron work, which has been cast in Belgium, is not expected to arrive until the second week of June, so that the bridge cannot be completed much before June 30.



**Salem, Va.**—An iron bridge will probably be built over the Roanoke River at Salem by the South Salem Land Co.

**Shepherdstown, Md.**—The stockholders of the Maryland & Virginia Bridge Co. will hold a meeting at Shepherdstown, May 3, for organization. The type of bridge to be built will also probably be decided.

**Toronto, Ont.**—The City Engineer of Toronto will receive proposals until May 20 for constructing two steel bridges in Toronto, one across the Rosedale Ravine at Sherbourne street and the other on Dundas street.

**Townsend, Mont.**—The County Commissioners of Meagher County have decided to build the bridge across the Missouri River at Townsend immediately. A bridge is also to be built across the Missouri River at Toston by the commissioners of Jefferson County when the former bridge has been finished.

**Washington, D. C.**—The engineers appointed to report on the proposed bridge across the Potomac River from the foot of New York Avenue southwest to Arlington, Va., estimate the cost of the bridge at \$3,500,000, if built 150 ft. above the river as is recommended. The site is midway between the Long Bridge and the Aqueduct Bridge.

**Wheeling, W. Va.**—The first three spans from the Ohio shore of the railroad bridge over the Ohio River at North Wheeling, being built by the Wheeling Bridge & Terminal Co., have been completed. The false work is now being erected for the channel spans.

Paige, Carey & Co., of New York City, have received the contract to straighten Caldwell's Run and build the iron bridge across it.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

*Central of New Jersey*, quarterly,  $1\frac{1}{2}$  per cent., payable May 1.

*Great Northern*, quarterly,  $1\frac{1}{2}$  per cent. on the capital stock of the St. Paul, Minneapolis & Manitoba, payable May 1.

*New York, Providence & Boston*, quarterly,  $2\frac{1}{2}$  per cent. *Portsmouth, Great Falls & Conway*,  $3\frac{1}{2}$  per cent., payable May 15.

##### Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Atchison, Topeka & Santa Fe*, annual, Boston, Mass., May 8.

*Atlantic & Pacific*, annual, 15 Broad street, New York City, May 15.

*Bessemer & Birmingham*, special, Birmingham, Ala., May 5, to act upon a proposed consolidation with the Birmingham Union.

*Birmingham Union*, special, Birmingham, Ala., May 5, to act upon a proposed consolidation.

*Burlington, Cedar Rapids & Northern*, annual, Cedar Rapids, Ia., May 27.

*Canada Southern*, annual, St. Thomas, Ont., June 4.

*Canadian Pacific*, annual, Montreal, P. Q., May 14.

*Catawissa*, annual, Philadelphia, Pa., May 5.

*Central of New Jersey*, annual, New York City, May 9.

*Chicago & Eastern Illinois*, annual, Chicago, Ill., June 4.

*Chicago & Northwestern*, annual, Chicago, Ill., June 5.

*Chicago, Rock Island & Pacific*, annual, Chicago, Ill., June 4.

*Chicago, St. Paul, Minneapolis & Omaha*, annual, Hudson, Wis., June 7.

*Cincinnati & West Virginia*, special, United Bank Building, Cincinnati, Ohio, May 12, to vote upon a proposed increase of the capital stock.

*Cleveland, Lorain & Wheeling*, annual, Cleveland, O., May 11.

*Delaware & Hudson Canal*, annual, New York City, May 13.

*Lake Shore & Michigan Southern*, annual, Cleveland, O., May 7.

*Louisiana & Missouri River*, annual, St. Louis, Mo., May 7.

*Louisville, New Orleans & Texas*, special, Memphis, Tenn., June 5.

*Mexican Central*, annual, Boston, Mass., May 7.

*Michigan Central*, annual, New York City, May 7.

*Milwaukee, Lake Shore & Western*, annual, Milwaukee, Wis., June 11.

*Missouri, Kansas & Texas*, annual, Parsons, Tex., May 21.

*New York, Chicago & St. Louis*, annual, New York City, May 7.

*New York & Harlem*, annual, Grand Central Depot, New York City, May 20.

*Norfolk & Western*, annual, Roanoke, Va., May 7.

*Pittsburgh, Fort Wayne & Chicago*, annual, Pittsburgh, Pa., May 21.

*Pittsburgh & Western*, annual, Allegheny City, Pa., May 5.

*St. Louis, Alton & Terre Haute*, annual, St. Louis, Mo., June 2.

*Texas Trunk*, annual, 503 Elm street, Dallas, Tex., May 6.

##### Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Mechanical Engineers* will hold its twenty-first annual convention at Cincinnati, O., May 13.

The *Railway Station Agents' Association* will hold its next annual convention at Cleveland, O., May 21.

The *Association of American Railway Accounting Officers* will hold its next annual meeting at the Stockton Hotel, Cape May, N. J., July 9.

The *Master Car Builders' Association* will hold its next annual convention at Old Point Comfort, Va., June 10.

Rooms should be secured of Mr. F. N. Pike, manager, Hygeia Hotel, Fortress Monroe, Va.

The *American Railway Master Mechanics' Association* will hold its next annual convention at Old Point Comfort, Va., beginning June 17.

The *National Association of General Baggage Agents* will hold its next annual convention at Chicago, Ill., July 16.

The *Traveling Passenger Agents' Association* will hold its next annual convention at Buffalo, N. Y., August 19.

The *New England Roadmasters' Association* will hold its eighth annual meeting at Boston, Mass., Aug. 20 and 21.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Saturday following the second Wednesday of each month at 7:30 p. m. in the director's room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m. in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

##### American Society of Mechanical Engineers.

The twenty-first meeting will be held at Cincinnati, May 13 to 16.

Arrangements have been made to secure special rates of railroad fare for the members and their ladies in attendance at the convention. These concessions are upon the "Certificate" plan. Members get the trip for one and one-third fare. These certificates are issued by the Ticket Agent, and not, as heretofore, by the Secretary's office. Members are requested to procure these certificates where possible, even when they do not expect to use them on the return. They will by so doing secure the concession for those who will use them, inasmuch as a certain minimum number must be certified to. These return tickets are not transferable, and do not permit of "stop overs" on the return. It has been found a pleasant feature of recent journeys to conventions to provide a special car, or cars, for the exclusive use of the members, who will board the train at an important centre in sufficient number to secure such privilege. It is proposed to do this for the Cincinnati trip also. The 2 o'clock train leaving New York via P. R. R. on Monday afternoon will be the most convenient one for the New York and the New England and Philadelphia tourists, and if enough passengers can be secured such car will be chartered. For more than 60 persons the party can have a vestibuled special train with a through dining car.

The headquarters at Cincinnati will be at the Gibson House.

The programme includes the following papers:

J. E. Denton: "The Measurement of Durability of Lubricants."

C. S. Dutton: "Some Experiences with Crane Chains."

Geo. H. Barrus: "Memoranda on Indicating Engines of the S. S. 'City of Richmond.'"

W. F. Dixon: "The Efficiency of Locomotives."

Willis E. Hall: "Working Railways by Electricity."

R. C. Carpenter: "Tests of Several Types of Engines under Conditions Found in Actual Practice."

J. B. Webb: "Peculiar Treatment of Chimney Draft and The Mechanical Theory of Chimney Draft."

De Volson Wood: "Graphic Representation of Thermodynamic Quantities" and "Chimney Draft."

R. H. Thurston: "Hirn and Dwellshauvers' Theory of the Real Steam Engine."

Geo. H. Barrus: "A Universal Steam Calorimeter."

D. K. Nicholson: "Heating Furnaces."

H. H. Supplee: "Equilibrium Arch Curves."

T. C. Clarke: "The Kinzua Viaduct, 1882."

Jesse M. Smith: "A Governor for Steam Engines."

Jno. E. Sweet: "Effect of an Unbalanced Eccentric in Shaft-governed Engines."

Among the topical questions are:

Does a boiler steam more freely if the tubes are arranged so to be further apart, horizontally, in the upper rows than in the lower rows?

Have you any data as to earth-work dams which would suggest the factor of safety with which they have been built?

What advantages as to construction and operation are offered by vertical bending rolls over horizontal rolls for plate?

What have you found is the best form of straightening machine?

Have you any experience with portable apparatus for light in large quantities (other than electric) for outdoor illumination for night work in wind and storm?

Have you had any experience with systems for purification of bad feed-water before it gets into a steam boiler, either by chemical precipitation or otherwise?

Have you had any experience with self-stoking

furnaces? How does yours operate and what difficulties and advantages does it offer?

What experience have you had with power-molding machines in the foundry? What difference do they make in the output?

Is it better or not to have the lead increase with the load in high-speed automatic engines, and if so, why?

Are there not advantages to be claimed for a medium amount of back pressure and high compression lines in the same class of engines?

Which is the better economy in a foundry cupola: rapid melting—producing a relatively cold iron—or slower melting—producing a hotter iron?

**Engineers' Club of Philadelphia.**

A business meeting was held April 19. President H. W. Spangler in the chair; 23 members and 2 visitors present.

The resignations of the following active members were accepted: Messrs. R. Meade Bache, H. C. Francis, S. F. Hutchinson, C. O. Lindroth, A. G. Mitchell, H. S. Pritchard and Chas. E. Taylor.

Mr. Wilfred Lewis presented a description of a new shaft coupling for the transmission of power to traveling cranes, etc. The description was illustrated by a number of interesting specimens.

An illustrated paper on the Purification of Water by Means of Metallic Iron was read by Mr. Easton Devonshire, Assoc. M. Inst., C. E., England, visitor to the club.

The objection to the use of ordinary sand filters as practiced in Europe, and the mechanical difficulties attending the use of chemically acting materials, such as spongy iron, when disposed in filter beds, were pointed out, the sand filters becoming foul and the purifying material rapidly losing its porosity and eventually its chemical activity.

A description was given of the method invented by Mr. William Anderson, M. Inst. C. E., England, for overcoming the defects of filter beds by placing metallic iron, in the form of cast-iron borings or plate punchings, in a revolving cylinder, through the hollow trunnions of which water is caused to flow, the iron being continuously showered down through the stream of water.

By this method, it is said, the particles of the metal are brought into intimate contact with the water, and by rubbing against one another present clean surfaces at all times. The action of the revolving purifier causes the formation of a protosalt of iron which, on aeration, creates a coagulating precipitate of ferric oxide. Special reference was made to the application of this process to the water supply of Antwerp, Belgium, and figures given showing that from a much polluted river water of a high standard of purity is supplied to that city at a low cost.

**Engineers' Club of St. Louis.**

The club met at 8:15 p. m., April 16, in the rooms of the Elks' Club, President Nipher in the chair; 27 members and two visitors present. Mr. Robert Moore, chairman of the committee on conference with the American Society of Civil Engineers, regarding proposed affiliation with that society, submitted a report for the committee.

After discussion, in which Messrs. Blaisdell, Prof. Johnson and others took part, it was on motion ordered that the consideration of this report be made the special order for the next meeting, the secretary in the meantime to send copies of the report to all members.

Mr. Isaac A. Smith read a paper on "Railway Inclines." He described fully the uses of these devices and gave his experience in their construction and operation. He made certain suggestions in regard to proposed improvements, which would increase their efficiency. He also gave figures on the cost of inclines, and that of the necessary steamers, locomotives and crews to operate them. He stated that an incline, embodying the improvements suggested, was now in process of construction at the foot of Mound street, in St. Louis. The discussion was participated in by Messrs. Robert Moore, Russell and Ferguson.

The Secretary read Mr. Arthur J. Frith's paper on "Some Practical and Theoretical Constitutions of the Screw as an Element of Mechanism." The author stated that the proper design of the screw depended upon the uses to which it was to be put, and he considered the question under a number of different heads. He called particular attention to the importance of having the coefficient of friction as small as possible. He also devoted special attention to the consideration of the screw as a means of transmitting power. The paper was illustrated by formulae and diagrams. The discussion was participated in by Messrs. Russell, Nipher, Johnson, Robert Moore, Baier, Seddon and Ockerson.

Mr. Robert Moore showed some cubes of clay, taken from the bottom of the Mississippi River at Memphis, where piers for a new bridge were being constructed.

Prof. Johnson gave some data regarding recent tests of granitoid beams, which showed that a mixture of six parts of granite to one of Portland cement was stronger than mixtures having larger proportions of cement. This matter was discussed by Messrs. Russell, Crosby, Seddon and Colby.

#### PERSONAL.

—Mr. Henry B. Riehle, head of the scale manufacturing firm of Riehle Bros., of Philadelphia, died on Friday last, April 25.

—Mr. James A. Norton has been appointed State Railroad Commissioner of Ohio by the governor, to succeed Mr. W. S. Capper.

—Mr. John Whittaker, Assistant General Freight Agent of the Pennsylvania, died suddenly April 30 at the Windsor Hotel, New York City.

—President, Ex., Norton, of the Louisville & Nashville, was severely injured this week by being thrown from a carriage at Radford, Va., while driving through the town in company with a party of railroad officials.

—Mr. George L. Bradbury, General Manager of the Lake Erie & Western, has also been appointed General Manager of the Fort Wayne, Cincinnati & Louisville, which is now controlled by the Lake Erie & Western.

—Mr. J. H. Burghardt, formerly Division Engineer of the proposed extension of the New York & Massachusetts, has been appointed Master Mechanic, with office at Poughkeepsie, N. Y., to succeed Mr. J. L. Donaldson; resigned.

—Mr. G. M. Beach, who recently resigned his position as General Manager of the Chicago & Atlantic, has accepted a similar position with the Pittsburgh & Lake Erie, to succeed Mr. E. Holbrook, who, it is reported, will become General Superintendent of the Western Division of the Baltimore & Ohio road.

—Mr. R. B. Whitney, Traveling Passenger Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned, to take effect June 1. He will be succeeded by



W. E. Brown, Traveling Passenger Agent of the New York Central & Hudson River road. Mr. Whitney will become the cashier of a new bank.

—Mr. M. S. Connors, Division Superintendent of the Cincinnati, Hamilton & Dayton, has tendered his resignation, to take effect May 1. Mr. Connors has been appointed General Superintendent of the Peoria & Pekin Union. He was formerly Trainmaster of the Cincinnati, Hamilton & Dayton at Indianapolis.

—Mr. D. H. Nichols, General Superintendent of the St. Louis & San Francisco, has tendered his resignation, to take effect May 1. It is denied that the recent accusations made against Mr. Nichols have any connection with his resignation. No evidence was given to substantiate these charges. Mr. Nichols has spent 24 years in the railroad service, this entire period in the service of the St. Louis & San Francisco, working up from clerk and office boy. He was appointed General Superintendent in October, 1886.

—Mr. George B. Harris, Vice-President and General Manager of the Chicago, Burlington & Northern, has been elected Second Vice-President of the Chicago, Burlington & Quincy, to succeed Mr. Henry B. Stone, who resigned to become President of the Chicago and Central Telephone Companies. Mr. Harris will also act as General Manager until a successor is appointed to Mr. E. P. Ripley, who resigned this week. Mr. Harris was formerly Assistant General Manager of the Atchison, Topeka & Santa Fe. He has been connected with the Chicago, Burlington & Northern since October, 1885, first as Assistant to the President, but a month later he was appointed General Manager.

—Mr. C. E. Harman, General Agent of the Central of Georgia in Atlanta, Ga., has been appointed General Passenger Agent of the Western & Atlantic, succeeding Mr. Alton Angier, who has accepted an appointment as United States Consul at Rheims, France. Mr. Harman, in 1881, became Soliciting Freight Agent of the Western & Atlantic, at Atlanta, and later General Southern Agent at Jacksonville. In January, 1885, the Western & Atlantic, Georgia, and Central of Georgia roads formed the Georgia associated freight lines, and Mr. Harman was appointed General Western Agent at Cincinnati. Last February he was appointed General Agent of the Central of Georgia at Atlanta.

—Mr. Edward P. Ripley, General Manager of the Chicago, Burlington & Quincy, resigned this week to accept the position of Second Vice-President of the Chicago, Milwaukee & St. Paul, which was created for Mr. J. C. Stubbs, of the Southern Pacific, and which he held for so short a time. Mr. Ripley will assume his new duties July 1, and in the meanwhile will take a short vacation and travel in Europe. Mr. Ripley is 45 years old, and has been in railroad service since 1868. His connection with the Chicago, Burlington & Quincy has extended over 20 years, the first eight years in the East. He was appointed General Freight Agent in 1878, Traffic Manager, June, 1888, and General Manager in November of the same year. Like so many of the other officers of the Chicago, Burlington & Quincy, Mr. Ripley distinguished himself during the engineers' strike two years ago by his high ability and force of character.

—Mr. Thomas G. Nock, President of the New York Locomotive Works, died at his home in Rome, N. Y., April 20, after a week's illness. He was born in London, England, in 1827, but came to this country when very young. He was Superintendent of the E. G. Ripley Iron & Steel Works, at Windsor Locks, Conn., between 1854 and 1864, and held a similar position with the Rome Iron Works, between 1864 and 1881. In the latter year he was elected President of the New York Locomotive Works, in the organization of which he had taken a prominent part. Those who have been intimately acquainted with him in his management of the New York Locomotive Works will remember him as a generous and considerate officer, ever ready to assist his employees in all their private affairs. In all charitable movements he was foremost among the large subscribers, and much of the improved condition of the city of Rome, N. Y., where he lived, is due to his efforts as a private citizen. Up to the time of his death Mr. Nock was a hard worker and to his efforts almost alone is due the success attained by the locomotive works under his charge.

#### ELECTIONS AND APPOINTMENTS.

**Baltimore & Ohio Southwestern.**—W. P. Townsend has been appointed Traveling Passenger Agent, with headquarters in Cincinnati, O. He was formerly connected with the Hannibal & St. Joseph Passenger Department, with headquarters at St. Joseph.

**Bellton, Homer & Carnesville.**—A company has been organized to build this proposed road. Madison Buice, of Covington, is President of the company and P. W. Edwards, of Homer, is Secretary.

**Central New England & Western.**—F. M. Rand has been appointed Auditor and Division Superintendent of the road.

**Chattanooga Southern.**—The office of General Manager of this road, formerly held by J. C. Henderson, of Chattanooga, is now consolidated with the position of President. Mr. Henderson is not now connected with this company, but is General Manager of the Chattanooga, Gadsden & Birmingham. We have made this announcement before, but as some confusion seems to still exist we have been asked to repeat it.

**Chesapeake & Ohio.**—W. J. Harahan has been appointed Resident Engineer of the Cincinnati & Huntington divisions, with headquarters at Huntington, W. Va., and will perform such duties as shall be assigned him by the Superintendent. F. A. Molitor has been appointed Engineer of Maintenance of Way of the Cincinnati division, with headquarters at Maysville. The Engineers of Maintenance of Way of the Cincinnati division and of the Huntington division report directly to the Superintendent, as heretofore.

**Chicago, Fort Madison & Des Moines.**—The directors have elected the following officers: D. B. Dewey, Chairman; Willard T. Block, President; E. S. Conway, Vice-President; Isaac N. Whitman, Secretary and Assistant Treasurer; Edgar C. Long, Treasurer; Jesse A. Baldwin, General Solicitor; William P. Scott, General Superintendent.

**Chicago & Western Rapid Transit.**—The incorporators and first Board of Directors are: E. Louis Kuhns, Harry A. Ritter, Alexander F. Shuman, Percy L. Shuman and Joseph H. Defrees, all of Chicago.

**Cincinnati & Dayton.**—The annual meeting of the stockholders of the company was held last week at Middletown, O. The following directors were elected:

C. F. Gunkel, P. J. Sorg, and Robert Wilson, Middletown; Julius Dexter, Eugene Zimmerman, and M. D. Woodford, Cincinnati, and F. B. Swain.

**Delaware, Susquehanna & Schuylkill Valley.**—The first Board of Directors of this Pennsylvania road, recently incorporated, is as follows: Eckley B. Coxe, Drifton, Luzerne County, Pa., President; Alexander Brinton Coxe, Arthur McClellan, and J. Brinton White, Drifton, Luzerne County, Pa.; E. B. Ely and Henry B. Coxe, New York City.

**Elwood Short Line.**—The following are the first directors of this Pennsylvania road: Henry W. Hartman, President, Beaver Falls, Pa.; T. D. Gause, L. Halsey Williams, and Merritt Greene, Beaver Falls; George I. Whitney, Francis D. Stephenson, and W. L. Standish, Pittsburgh.

**Fort Wayne, Cincinnati & Louisville.**—George L. Bradbury has been appointed General Manager of this company.

**Georgia, Tennessee & Illinois.**—The following are the officers of this road: President, W. B. Thomas, Tennille, Ga.; Vice-President, J. M. McBride; Treasurer, R. L. Spencer; Secretary, J. W. Plummer, and Chief Engineer, L. F. Bellinger, all of Tallapoosa, Ga.

**Great Northern.**—Edward Sawyer has been appointed Treasurer of the Montana Central, with office at St. Paul, vice S. J. Beals resigned.

**Kanawha & Michigan.**—A new charter has been filed in Ohio for the Kanawha & Ohio, under this name. The incorporators are: Nelson Robinson and Wm. B. Post, of New York, and C. P. L. Butler, Jr., G. C. Hoover and George Hardy, of this city. The first board of directors are: R. W. Kelley, of New York; E. J. Jones and Henry L. Woodward, of Athens; David W. Patterson, Jr., and Frank Cox, of Charleston, W. Va.

**Kansas City, Fort Scott & Memphis.**—Karl Sporek has been appointed Resident Engineer in charge of construction work on lines north and west of Springfield, Mo.

**Kearney, Hutchinson & Gulf.**—The directors and officers of this Nebraska company are: Directors, A. H. Connor, G. W. Whiteaker, H. H. Seeley, H. H. Martin, Chas. Yost, W. H. Holden and W. C. Holden. Officers: G. W. Whiteaker, President; H. H. Martin, Vice-President; H. H. Seeley, Treasurer, and W. C. Holden, Secretary. The principal office is at Kearney, Neb.

**Louisville, New Albany & Chicago.**—The company and nounced these changes: H. A. Hathaway has resigned the office of general Southern passenger agent, and that office has been abolished. Edward F. Black has been appointed general traveling passenger agent for the territory south of the Ohio River, with headquarters at Louisville. W. G. Crush has been appointed district passenger agent, with headquarters at Louisville.

**Manistee & Grand Rapids.**—The officers of this company are: John Canfield, President; Louis Sands, Vice-President; E. G. Filer, Treasurer; T. J. Ramsdell, Secretary, and E. W. Muenschner, Chief Engineer, all of Manistee, Mich.

**Nashville & Knoxville.**—The stockholders held a meeting last week for the annual election of officers and directors. The directors elected were as follows: J. M. Hamilton, Nashville, Tenn.; A. J. Crawford, Terre Haute; L. S. Hoyte and J. P. Crawford, Newcastle, Pa., and A. Vandivort, Lebanon. The election of officers was deferred.

**New Albany Belt & Terminal.**—John McLeod, of Louisville, has been appointed Chief Engineer of the company.

**Newport News & Mississippi Valley Co.**—J. L. Murphy, General Freight & Passenger Agent of the Eastern division, having resigned, has been succeeded by C. L. Brown, General Freight Agent of the Kentucky Central.

**New York, Lake Erie & Western.**—James W. Morris has been appointed Division Roadmaster of the Western Division, with office at Galion, O., vice W. A. Van Frank, transferred.

**New York, Pennsylvania & Ohio.**—At a meeting of the bondholders of the company in London, April 30, Gen. Sir George Balfour, M. P., the Rev. J. Sackington Bates and Sir Charles Tennant were elected voting Trustees for the first mortgage bondholders. Henry Cecil Raikes, M. P., will act for the second bondholders.

**Phillips & Rangeley.**—The names and addresses of the officers of this Maine road are: President, Hon. Henry P. Closson, of Randolph, Me.; Manager, Waldo A. Rich, of Woodford's, Me.; Secretary and Treasurer, Fremont E. Timberlake, of Phillips. The Manager has been heretofore referred to as William A. Rich.

**Pittsburgh & Lake Erie.**—G. M. Beach has been appointed General Manager, to succeed E. Holbrook, resigned. C. H. Bronson has been appointed Auditor to succeed H. H. Kendrick, resigned. He has for several months been in the auditing department of the Cleveland, Cincinnati, Chicago & St. Louis, and was previously Auditor of the Chesapeake & Ohio for about eight years.

**Seaboard & Roanoke.**—The jurisdiction of Maj. John C. Winder as General Manager of this system will extend over the following roads after May 1: Seaboard & Roanoke, Roanoke & Tar River, Raleigh & Gaston, Louisville, Raleigh & Augusta Air Line, Pittsboro, Carthage, Carolina Central and Georgia, Carolina & Northern. His office will remain at Raleigh, N. C.

L. T. Myers, Superintendent of Transportation of the Seaboard & Roanoke, has been appointed General Superintendent of the above named roads, with office at Portsmouth, Va. John H. Winder has been appointed Superintendent of the Seaboard & Roanoke and Roanoke & Tar River roads, with office at Portsmouth, Va.

**Staten Island.**—Two weeks ago, on page 274, *Railroad Gazette*, the officers and directors elected by this company at its annual meeting were credited to the Staten Island Rapid Transit road. No change has been made in the officers or directors of the latter company, and they are different for the two roads, though the Staten Island is a leased line of the Staten Island Rapid Transit.

**Staten Island Rapid Transit.**—The office of Charles Ackenell, Chief Engineer of the Staten Island Rapid Transit and Baltimore & New York roads, has been removed from Elizabeth, N. J., to the general offices, foot of Whitehall street, New York City. His residence is at St. George, Staten Island.

**Union Pacific.**—The annual meeting of stockholders was held in Boston, April 30. The only change was the

election as a director of Marvin Hughitt, of the Chicago & Northwestern, to succeed the late David Dows.

**Valley (Ohio).**—At a meeting of the company held in Cleveland, O., April 16, S. T. Everett was elected Vice-President and Henry M. Keim, Treasurer.

**Western & Atlantic.**—Alton Angier having resigned the position of General Passenger Agent of this company to accept a position in the diplomatic service of the United States Government, Charles E. Harman has been appointed his successor, effective May 1, 1890.

**West Virginia Central.**—J. G. Miller has been appointed Auditor of this company, with office at Cumberland, Md., dating from May 1, to succeed G. D. Woodrow.

**Whitewater.**—B. E. Sutton, General Agent of the Chesapeake & Ohio at Ashland, Ky., has been appointed Superintendent of the road.

**Wisconsin Southern.**—The incorporators are: Thomas Whitney, Croft W. Higgins, Frederick K. Bowes, Wm. Glenn and Henry L. Lee, all of Chicago.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Bellevue Valley.**—The articles of incorporation of this company were filed in Missouri last week. The road is to extend from Iron Mountain Station, Iron County, to the Schneider stone quarry, a distance of three and three-quarter miles. The incorporators are: Philip W. Schneider, Philip W. Schneider, Jr., Julius A. Schneider, L. A. Coquard and M. M. Buck, all of St. Louis.

**Bennettsville & Society Hill.**—This is the name of the proposed road from Society Hill northeast to Bennettsville, S. C., 11 miles, which was referred to last week under "new roads." The survey has been made by Thomas S. Lucus, of Society Hill. Trestling will be necessary for two miles across the Great Pee Dee swamp. The company will probably use the wooden highway bridge across the Pee Dee River, which was constructed for a railroad bridge. It is of the Burr type. The line will connect at Society Hill with the Cheraw & Darlington, which is a part of the Atlantic Coast Line and at Bennettsville with the Cape Fear & Yadkin. Bennettsville will then be 140 miles from Charleston by rail. The road is projected by J. J. Lucus, of Society Hill, and he expects to secure liberal subscriptions to the stock in Marlborough County, of which Bennettsville is the county seat.

**Buffalo & Geneva.**—The bids for constructing this road between Grimesville, near Buffalo, to Geneva, N. Y., 93 miles, were submitted March 20, but the awards were not made until April 28. The contracts were let as follows: J. C. Rogers, New York City, Sections 1 to 10; Ward & Leary, Newburgh, N. Y., 11 to 20; Dick & Mantz, Hazleton, Pa., 21 to 30; W. R. Haven & Co., Buffalo, N. Y., 31 to 40; Broadhead & Hickey, Newark, N. J., 41 to 55; Dowling & Kennedy, Binghamton, N. Y., 56 to 70; John R. Fisher, Harrisburg, Pa., 71 to 93. The contract for all the trestle work has been awarded to Ellsworth, Chapman & Co., of Rochester, N. Y.

**Burkesville & Northwestern.**—The preliminary survey has now been made from Burkesville to Horse Cave, Ky., and the line to Glasgow will now be surveyed. These are the two alternative routes. It has not been decided which of these lines to adopt. The former is from Burkesville, via Marrowbone, Edmonson and Heseville to Horse Cave, 45.8 miles, and the second is from Burkesville, via Marrowbone and Summer Shade, to Glasgow, Ky., 36 miles. The contract will probably be let within 60 days for the grading. The work is rather difficult, mostly rock, although the line is a particularly good one for the section of country it is proposed to build through. The maximum grades are 90 ft. and 66 ft. The 90-ft. grade will be used in probably three cases. The curvature is 6 degrees. There will be two tunnels, 1,000 ft. long each, and about four iron bridges, each 105 ft. long. The prospects are declared to be very flattering for the early completion of the road. Dr. W. G. Hunter, of Burkesville, has charge of the financial arrangements. W. F. Alexander is President and H. A. Genung is Chief Engineer, both of Burkesville.

**Calgary & Edmonton.**—A special meeting of the shareholders will be held at Montreal on May 26, to authorize the directors to make arrangements for bonding the road, and to enter into any agreements with the Dominion Government in reference to the subsidy or land grant, and also with the Canadian Pacific for operating the line.

**Canada Atlantic.**—Arrangements are being made for the extension of this road from Ottawa to Parry Sound. The Parry Sound Colonization road from Parry Sound to Burk's Falls, 40 miles, surveying on which is now going on, will form part of the route. From Ottawa the new line will run direct to Arnprior, thence west to Burk's Falls. The surveying was commenced last week on the southern end.

**Canadian Government Roads.**—The government intends to commence active operations shortly on all government lines now under construction. It is expected that ballasting on the Cape Breton road and also on the Oxford & New Glasgow will be begun within ten days, provided the frost is out of the ground. It is hoped that both of these roads will be completed and opened for traffic early the coming summer.

**Canadian Railroads.**—At a meeting of the Railroad Committee of the Dominion Parliament last week the Ontario Pacific bill, enabling the company to cancel unissued bonds and issue others at a lower rate of interest, was passed. There was considerable opposition to the Saskatchewan Colonization & Railway Co.'s bill, which had been previously passed by the committee, and referred back for further consideration by the House. It was objected that its passage would injure the prospects of the Winnipeg & Hudson's Bay road, and that this route was already partly covered by the Winnipeg & Northern Pacific charter. This bill and that to incorporate the Portage la Prairie & Duck Mountain were defeated. The present method of granting charters by Parliament was strongly criticised. Sir John Macdonald stated that Parliament should grant no charter without clear, reasonable evidence of the capacity and intention of the companies to build. He intended to introduce a bill in Parliament for this purpose.

**Chattanooga, Gadsden & Birmingham.**—The officers expect to begin active construction work by June 15 at Gadsden, Ala. The grading will be first pushed south toward Birmingham. It is proposed to make a connection at Gadsden with the Chattanooga



Southern or Louisville & Nashville. J. C. Henderson, of Chattanooga, is General Manager.

**Chicago, Fort Madison & Des Moines.**—The stockholders have authorized an increase of capital stock from \$2,500,000 to \$5,000,000. A contract has been made with the Illinois & Iowa Construction Co. to rebuild the present line and make it standard gauge; also to extend it to Des Moines either via Ottumwa or Oskaloosa.

**Chicago & West Michigan.**—McDonnell Bros. & Co., of Grand Rapids, Mich., have been awarded the contract for building a branch of this road about 7½ miles long, from Holland, Mich., along the north side of Black Lake to Ottawa Beach and Mackatawa Park, pleasure resorts at the outlet of Black Lake into Lake Michigan. The branch is to be ready for operation before July 1. The work is very light, and maximum grades are one per cent, and maximum curves five degrees. The contract amounts to about \$20,000; the company furnishes the rails, ties and other track material.

**Cincinnati, Wabash & Michigan.**—The right of way for the southern extension from Anderson to Rushville, Ind., 40 miles has been entirely secured on the section between Anderson and Knightstown, and the contract for grading the line will be let May 10.

**Dayton, Hocking Valley & Eastern.**—The company has been incorporated in Ohio to build a road from Marietta, on the Ohio River, to Dayton, passing through the counties of Washington, Athens, Hocking, Vinton, Ross, Fayette, Green and Montgomery. The incorporators are H. D. Marshall, J. K. McIntire, Frank T. Hoffman, Charles E. Drury, and Jacob Luxweiler, Jr., all of Dayton. The capital stock is \$200,000.

**Deer Creek & Susquehanna.**—It is stated that the sub-contractors of this company, in Harford county, Md., have been notified by McCabe & Bros. to prepare to resume work immediately. It is believed that the work of straightening and widening the gauge of the Maryland Central road will be commenced about the same time, as this is a necessary part of the scheme to secure a connection between Baltimore and the Philadelphia & Reading.

**Denver & Rio Grande.**—A survey is being made for an extension of the Villa Grove branch from Villa Grove through northern Sagauche County to Alamosa, Colo., about 60 miles.

**Elwood Short Line.**—This company was incorporated in Pennsylvania last week to build a road four miles long, from a point near North Sewickley Station, on the main line of the Pittsburgh & Western, in Beaver County, to Rock Point Station, in Lawrence County, also on the main line of the Pittsburgh & Western. The capital stock is \$200,000. H. W. Hartman, of Beaver Falls, Pa., is President.

**Fremont & Yankton.**—Articles incorporating the company were filed in Nebraska last week. The capital stock is placed at \$1,000,000.

**Franklin & Nashville.**—The survey has been finished from Franklin along North Main street north to Glendale Park, 13 miles, where connection will be made with the line extending to Nashville, Tenn., 19½ miles from Franklin. The road is to be a dummy line. There is already a line of the Louisville & Nashville between the two points, and there is some opposition at Franklin to the scheme, as unnecessary.

**Georgia, Tennessee & Illinois.**—This road is to extend from Tallapoosa to Chattanooga, about 110 miles, passing through Esom Hill, Cave Spring, Thomas' Mills, Holland's Store, Foster's Store and Menlo. It is a very mountainous and difficult location. In one place the fall is 400 ft. in two and a half miles. The attempt will be made to locate with 1 per cent. ruling grades and 16 to 20 degree maximum curves. The preliminary survey to Cave Spring, 34 miles, has been completed. Within two weeks a transit party, a level party and a topographical party will be formed to run a line to Rockmart from Tallapoosa. L. F. Bellinger, of Tallapoosa, is Chief Engineer.

**Grand Trunk.**—A force of about 400 men is working on the double tracking between Belleville and Gananoque, Ont., 65 miles, for which McArthur Bros., of St. Paul, have the contract.

**Great Falls & Canada.**—A dispatch states that 60 miles of grading from Great Falls, Mont., to Lethbridge has been finished from the former town, and that track will be laid on this section at once. Over 2,000 men are reported as engaged in the construction work. The Alberta Railroad & Coal Co. has been consolidated with this company.

**Huntington & Big Sandy.**—The company has been incorporated in West Virginia to build a road from Huntington, W. Va., down the Ohio River to the mouth of the Big Sandy. The road will connect with the extension of the Norfolk & Western at Ceredo and form a connecting link between it and the Chesapeake & Ohio. It is understood that the project is in the interest of the Chesapeake & Ohio.

**Indiana & Lake Michigan.**—The ballasting on this extension of the Terre Haute & Indianapolis is now practically finished, and it is believed that trains will begin running shortly on a regular schedule between South Bend, Ind., and St. Joseph, Mich., 40 miles.

**International & Great Northern.**—A report was circulated last week that the company would extend the road from Columbia, Tex., to the mouth of the Brazos River, but an officer states that there is no present intention of constructing the line this year.

**Kanawha & Michigan.**—The Kanawha & Ohio this week filed a new charter in Ohio, changing its name to the Kanawha & Michigan, under which name it is proposed to hereafter operate it, the lease to the Chesapeake & Ohio not having been concluded. Robert W. Kelly, of New York City, has been elected President.

**Kearney, Hutchinson & Gulf.**—The company has surveyed a line 65 miles southeast from Kearney, Neb., through the towns of Minden and Red Cloud. The line is through a rich agricultural country. The work is not heavy; the maximum grade is one per cent, and the maximum curves three degrees. The prospect of building the line very soon is claimed to be good. It is expected that Kearney will vote \$200,000 to the company as local aid. There are several other roads projected to extend through Kearney. The Kearney & Black Hills is pushing work, and a line from Yankton, Dak., to Holdrege is soon to be surveyed, which will pass through Kearney.

**Louisville, Harrods Creek & Westport.**—A bill has been introduced in the Kentucky Legislature to authorize an extension of this line through the counties of Old-

ham, Trimble, Carroll, Gallatin, Boone and Kenton to Covington. The road is understood to be projected in the interest of the Louisville & Nashville, and is in opposition to the Louisville, Covington & Cincinnati.

**Macon & Savannah.**—Col. E. C. Machen, President of the road, is quoted as saying there that the contract has been let in four sections for the first 90 miles of the road from Savannah to a point south of Swainsboro, Ga. Rights-of-way are being obtained, and as soon as the survey is finished for some distance the contractors will begin work in Savannah. This line is a division of the Middle Georgia & Atlantic, and will connect with that road in Emanuel County, south of Swainsboro.

**Manitoba Colonization.**—The survey mentioned last week is to be continued from Glenboro and Plum Creek, Man., in a southwesterly direction to Melita, where it will connect with the Southwestern and Souris branches. From Melita a line will be run westward to the Souris coalfield.

**Manistee & Grand Rapids.**—About 150 men are now working on the grading of this road near Manistee, Mich. This is the company's own force, no contractors being employed. The grading has been completed on the first 3½ miles, and the next two-mile section is now under construction. The tracklaying will begin about May 15. As has been previously stated, the road is to extend from Manistee to Grand Rapids, about 110 miles. The intermediate points have not been determined except the crossing of the Manistee branch of the Flint & Pere Marquette, one mile south of Stronach. The grading near Manistee is quite heavy, but mostly sand. Farther on the work is still undetermined. The maximum gradient are one per cent, on tangents, flattened on curves. The maximum curvature is 10 degrees.

The section of grading completed was mostly heavy work, one embankment containing 800,000 cubic yards. A 5½ mile section is being located beyond the terminus of the line now being graded. The combination truss bridge for an overhead crossing of the Flint & Pere Marquette is being built by the Massillon Bridge Co. This is the only bridge on the section now being constructed. Rolling stock sufficient for ten miles is already bought. The money used for building and equipping the road so far has been raised by stock subscription. E. W. Muencher, of Manistee, is Chief Engineer.

**Nashville, Chattanooga & St. Louis.**—The Duck River Valley road of Tennessee, 120 miles in length, will hereafter be known as the Huntsville, Fayetteville & Columbia division of this road. It was formerly a narrow gauge line, but has been changed to standard gauge.

**Nashville & Knoxville.**—The bridge over Caney Fork is now nearly completed, and tracklaying east of that point toward Cookeville, Tenn., has been commenced.

**New Roads.**—A survey is being made from the Dunkirk, Allegheny Valley & Pittsburgh, a little north of Falconer, to Jamestown, N. Y., and it will be built in the interest of that road if the right of way is given.

O. L. Houghton proposes a road from the Los Cerrillos coal lands southeast of Santa Fe, N. M., to San Antonio, Tex., and southeast.

**Northern Pacific.**—Chief Engineer Kendrick said this week, speaking of the work the company has under way and in project: "At Spokane Falls we will lay out new yards and build a new freight-house and new passenger station, the improvements costing \$365,000. We will construct a line to Lewiston, Idaho, probably beginning at Pullman, on the Spokane & Palouse Branch, extending thence through Moscow to the head of Bear Creek, thence down Bear Creek, Potlatch and Clearwater, to Lewiston. The length of the line will be 72 miles. In Washington we will continue the construction of the line from Durham North. In Western Washington we have in contemplation the construction of ample terminal facilities in Seattle. The cost of the improvements now contemplated will be \$250,000. At Tacoma we are now receiving proposals for shops and additional trackage rendered necessary by the increase in the company's business there. East of Idaho our principal work is upon the line west from Missoula to the Coeur d'Alene country."

Three parties of engineers are now surveying the line from Tacoma west, through Olympia and Montesano Wash., to Gray's Harbor, referred to two weeks ago. These parties at present are working on the section between Montesano and Gray's Harbor, two east from Gray's Harbor and the third west from Montesano. It is reported that a survey will also be made for a 12-mile road from Tacoma to Hood's Canal around the headwaters of Eld and Tacten inlets to Skokum inlet, connecting there, at Kamille, with the Puget Sound & Gray's Harbor road. This line is completed to Montesano, 40 miles, and is owned by the Port Blakely Mill Co., and may be purchased by the Northern Pacific, as the construction of many miles of new road would thus be avoided. The activity of the Northern Pacific in surveys and proposals to construct new lines in northwest Washington is due largely to the activity of the Union Pacific, Oregon Improvement Co., and others in similar projects.

**Old Colony.**—The Massachusetts State Railroad Commissioners have decided in favor of this company in the matter of the petitions of that road and the New York & New England for permission to construct a branch loop road from Norwood to Walpole. The only question involved was whether the public convenience and necessity required the construction of the proposed loop, and if so by which corporation. Several hearings have been held. In deciding for the Old Colony the board says that if the petition of the Old Colony is granted the New York & New England will suffer in loss of revenue more than the Old Colony would. The board says it would not take action which would lead to such a result were it not convinced beyond a reasonable doubt that public necessity and convenience would be much better subserved by the building of the line proposed by the Old Colony than by that of the New England Road. On this point, it says, not only is the sentiment of the district unanimous, but it is clear from a study of the situation that such must be the case.

**Omaha & St. Louis.**—At a special meeting of the stockholders, held this week, second mortgage bonds for \$500,000 were authorized, conditioned that \$4,000 more may be issued for each mile of extension. It is probable that the 35 miles between Trenton and the Omaha & St. Louis will be completed this year.

**Ottawa & Parry Sound.**—The survey has been made from Renfrew, Ont., through the valley of the Bonnechere River to Killaloe, thence across to the Opeongo and the Madawaska Valley as far as Booth's station. The surveyors will reach the western terminus shortly.

The total distance between Renfrew and Parry Sound is 180 miles.

**Pennsylvania.**—The new construction work to be done on the Southwest Pennsylvania division was referred to last week. It will be on the North Sewickley, Hecla & Mt. Pleasant and Turtle Creek Valley branches. The completion of the Sewickley branch will give a line through the coke region from Fairchance to Latrobe, on the Pennsylvania. The line to be built is between Paliner, Simmonds and Tranger station, five miles. The maximum curvature is six degrees, and the maximum grade is 1.35 per 100 ft.

The Hecla & Mt. Pleasant branch is a short line between Hecla and Mt. Pleasant connecting with a number of coke works. The Turtle Creek Valley road will connect with the Pennsylvania at Stewart Station, and will be built to Murrysburg, Pa., in the natural gas fields. The distance between these points is seven miles, of which five miles have been graded, leaving the two miles nearest to the Pennsylvania road to be graded. The bids for the work have been received and the contracts will be let soon. The work is in charge of J. M. Dyers, of Greensburg, Pa., division engineer of the Pennsylvania road.

**Pittsburgh, Akron & Western.**—The subcontract for the road between Carey and Akron, O., 110 miles, has been let to Creech & Lee, of Herington, Kan. The construction is to be begun at Carey at once, and pushed eastward. The contract includes changing the gauge of 56 miles of the Cleveland & Western between Delphos and Carey.

**Plymouth & Middleboro.**—The proposition to vote this company \$40,000 was carried at the Plymouth town meeting, April 26. The matter was fully explained last week. It was asserted by some of those supporting the proposal that the New York & New England would build a branch from Attleboro to Middleboro to connect with this road, and that it would then lease it, and in addition that it would take \$100,000 of the stock, if \$80,000 was subscribed by others, \$40,000 of this being that asked of the town.

**Portland, Port Angeles & Victoria.**—This company, which was recently incorporated in Washington, will elect officers and complete its organization in a few days. The preliminary survey will then be begun at Portland, Ore., continuing through Gray's Harbor and the fertile country known as the Quillayute Valley and across the Olympic Range to the Straits of Juan de Fuca and Port Angeles, Wash. The distance from Portland to Victoria will probably be 240 miles. Lewis Levy, of Port Angeles, is a director.

**Rio Grande Junction.**—The Colorado Midland has finished the tracklaying on over 15 miles west of Rifle Creek, Col., and is now laying 1½ miles a day. It is believed that the 63 miles to Grand Junction will be finished by May 20.

**St. Albans & Coal River.**—M. P. Opearn, President of this proposed road, states that all the funds to build the road have been secured, and that work will be begun in a few weeks. The route of the road is from the Chesapeake & Ohio at St. Albans, W. Va., up Coal River to the rich coal fields of Boone County.

**Shuswap & Okanagan.**—The contract for building this line has been let to Riley & Co., of Victoria, B. C. The locating survey has not yet been made, but will be commenced immediately. As soon as the first section from Sicamous has been located construction work will probably begin. The route from Sicamous will follow as far as practicable the western shore of Mara Lake to Enderby and through the more open country to Vernon. The line will be about 50 miles long. When completed the road is to be operated by the Canadian Pacific. That company is to pay 40 per cent. of the gross earnings to the Province of British Columbia, and this sum will be used toward the payment of interest on the bonds, which has been guaranteed by the province.

Engineers are now running a survey for the Kootenay & Okanagan road, which is to be a continuation of this line east from Okanagan Lake to the Kootenay and Columbia rivers.

**Southern Pacific.**—The determination to put a large force of men on the construction of the Oakdale extension has been reconsidered, and it has been decided not to resume work on the line at present.

**Stuttgart & Arkansas River.**—The grading has now been completed on this road for 45 miles, from Pendleton to DeWitt, and toward Stuttgart, Ark. The tracklaying has been completed on 12 miles of this section, and an additional 12 miles will be completed and ready for operation in 60 days. Trains will probably be running within that time. The company desires to purchase 600 tons of 35-lb. rails delivered at Memphis, Tenn., or Cairo, Ill. F. M. Gillett, of New York City, is President, and T. H. Leslie, of Stuttgart, is Secretary.

**Toronto, Hamilton & Buffalo.**—The locating survey through Hamilton, Ont., has now been practically finished, and the engineers are running the lines for the Brantford branch.

**Victoria & Western.**—This road will probably be placed in operation in a few days instead of June 1, as intended. The road extends from Goshen, on the Chesapeake & Ohio, to Oreville, Va., 18 miles, but probably that section between Goshen and Rockbridge, 10 miles, will be opened for traffic some time before the rest of the line.

**Winnipeg & Hudson's Bay.**—The Dominion Government has, it is stated, decided to grant the aid asked by this company. The government was asked for a guarantee on \$5,000,000 at 3½ per cent. for 35 years, and it is understood that it will grant the request. Hugh Sutherland, the President, has asserted that if this aid is granted the road would be built.

**Winnipeg & Southeastern.**—The directors have voted to resume the survey on this road and to complete the location from Winnipeg to the international boundary line, where it is proposed to connect with the Duluth & Winnipeg or other line, building north from Duluth toward Winnipeg.

**Wisconsin Southern.**—This company has filed articles of incorporation at Madison, Wis., to construct a road from Shullsburg, on the Chicago, Milwaukee & St. Paul, west to Rutledge on the Mississippi River, in Grant County, 30 miles. The capital stock is \$1,000,000.

#### OLD AND NEW ROADS.

**Allegheny Valley.**—In the United States Circuit Court, at Pittsburgh, April 28, Judge Acheson refused to



grant the petition of the income bondholders, asking for the sale of the road.

**New York, Lake Erie & Western.**—The gross and net earnings for March were as given in the following table:

Month of March.			
	1890.	1889.	Inc.
Gross earnings.....	\$2,212,487	\$2,113,191	\$129,296
Oper. expen.....	1,446,298	1,358,212	87,996
Less proportion due leased lines.....	\$796,279	\$754,979	\$41,300
Net earnings.....	\$603,575	\$558,938	\$44,637
Six Months, Oct. 1 to March 31.			
	1890.	1889.	Inc.
Gross earnings.....	\$13,926,793	\$12,713,076	\$1,213,717
Oper. expen.....	9,174,610	8,326,322	848,288
Less proportion due leased lines.....	\$4,752,183	\$4,386,754	\$365,429
Net earnings.....	\$1,278,537	\$1,141,763	\$136,774
Net earnings.....	\$3,473,646	\$3,244,991	\$228,655

**Canadian Pacific.**—At the annual meeting in Montreal, May 14, the stockholders will consider the following propositions: To provide for the issue to a limited amount of bonds in aid of the acquisition of steam vessels, under the Dominion Act, and for securing such issue according to the provisions of that act. To authorize and ratify an agreement with the Shuswap & Okanagan Company concerning the leasing and operation of that road. To authorize arrangements with the Columbia & Kootenay Railway Navigation Co. to provide for the construction and operation by this company of the road and other works of that company. To provide for the construction and equipment of the Souris Branch (which branch is to include extensions in Southern Manitoba and to the west thereof), and for the issue of bonds in aid thereof, and for securing such issue. To provide for the issue of consolidated debenture stock for the purpose of satisfying or acquiring bonds issued in aid of the purchase of ocean steamships.

The earnings for March and the three months are shown in the following table:

March.			
	1890.	1889.	Inc.
Gross earnings.....	\$1,159,226	\$1,128,623	\$21,603
Oper. expenses.....	785,828	764,951	20,877
Net earnings.....	\$364,398	\$363,672	\$726
Jan. 1 to March 31:			
	1890.	1889.	Inc.
Gross earnings.....	\$3,007,375	\$2,870,607	\$136,768
Oper. expenses.....	2,291,724	2,205,428	86,296
Net earnings.....	\$715,651	\$665,179	\$50,472

**Canadian Roads.**—A return just laid before parliament shows that the subsidies to railroads, excepting the Canadian Pacific main line and the Sault branch, since the confederation have been distributed as follows: Ontario, \$1,070,850; Quebec, \$2,428,341; New Brunswick, \$890,118; Nova Scotia, \$1,115,812; British Columbia, \$750,000. The several roads built by the Dominion in each province, including the Intercolonial branches and extensions, but not the main line as originally constructed, have cost as follows: Quebec, including purchase of River du Loup, \$5,520,323; New Brunswick, \$3,371,853; Nova Scotia, \$7,821,070.

**Chicago, Burlington & Quincy.**—The gross earnings of the system for March were \$3,160,746, an increase of \$502,748 as compared with the same month of last year. Net earnings, after deducting 1-12 of the annual charges, were \$508,802, an increase of \$385,307. For the four months ending March 31 the gross earnings were \$3,467,566, an increase of \$332,000 as compared with the corresponding period of last year, and net earnings, after deducting charges, \$729,888, an increase of \$557,359. The company has issued a circular to its stockholders, offering them the right to subscribe to five per cent. 13-year debenture bonds at par in the ratio of 10 per cent. of their present holdings of stock. This will make a total issue of \$7,639,450 of bonds. The new bonds will be convertible into stock at par. The proceeds of the issue will be applied to the construction of 100 miles of new road in Wyoming and in the vicinity of the Black Hills, and to retire about \$2,500,000 of bonds falling due this year.

**New York, Lake Erie & Western.**—A traffic agreement, to take effect May 4, has been entered into by this road and the Cincinnati, Hamilton & Dayton, by which the traffic of the Erie destined to Cincinnati and points beyond will be delivered at Dayton to the Cincinnati, Hamilton & Dayton instead of the Big Four, as at present. This same arrangement between the Erie and the Cincinnati, Hamilton & Dayton was in existence prior to 1883.

**Norfolk & Western.**—The annual report for the year to Dec. 31, 1889, gives the gross earnings as \$5,597,124; operating expenses and taxes, \$3,483,352; and net earnings, \$2,113,772; other income, \$144,147; total income, \$2,257,919. After paying a three per cent. dividend a surplus of \$105,047 was left. The number of miles operated was 591; the number of tons of freight carried, 3,435,257; number of tons of coal and coke transported, 2,124,249, and the number of tons of pig iron carried, 161,215. The report says the completion of the many new iron furnaces and other industrial establishments now in course of construction will greatly add to the traffic and earnings. A very considerable increase of traffic may also be anticipated from the development of the mineral and timber resources upon the Clinch Valley extension, and the completion of that extension to a connection with the Louisville & Nashville, at Norton, will undoubtedly prove important additional sources of traffic and revenue. The traffic of the company during the past year taxed its transportation and terminal facilities to the utmost. It will be necessary during the year to double track portions of the line, aggregating about 50 miles in length, to construct additional siding and passing points, and to provide additional terminal facilities. Additional equipment will also be required.

For the construction of the Ohio extension from Elkhorn to Ironton, a distance of 195 miles, such of the new five per cent. bonds will be sold as will be necessary. The total issue was \$10,000,000, of which \$1,000,000 is for Norfolk terminal purposes, \$975,000 for improvements, \$6,000,000 for the Ohio extension, \$1,500,000 for the North Carolina extension of 70 miles, from Ivanhoe to the North Carolina state line, and \$525,000 for retiring a debenture loan. Of these \$2,000,000 were sold during the year. The completion of the North Carolina extension to a connection with the Cape Fear & Yadkin Valley will open up a through line for the interchange of traffic between the northwestern states and the states of North and South Carolina and the South Atlantic seaboard.

The statement of earnings and expenses for March and the quarter is as follows:

Month of March:			
	1890.	1889.	Inc.
Pass., mail, exp.....	\$92,214	\$79,811	\$12,403
Freight.....	395,851	363,424	32,427
Gross earn.....	\$488,065	\$443,235	\$44,830
Expen., taxes.....	315,813	271,480	44,333
Net earnings.....	\$172,252	\$171,755	\$497
P. c. of expen. to gross earn.....	65	61	4
Three months Jan. 1 to March 31:			
	1890.	1889.	Inc.
Pass., mail, exp.....	\$267,894	\$228,089	\$39,805
Freight.....	1,175,560	1,016,230	159,330
Gross earnings.....	\$1,443,454	\$1,244,319	\$199,135
Expen., taxes.....	952,790	827,998	124,792
Net earnings.....	\$490,664	\$416,321	\$74,343
P. c. of expen. to gross earn.....	66	67	1

**Philadelphia & Reading.**—The statement of the operation of the railroad for the month of March, 1890, as compared with the same month of 1889, is as follows:

March.			
	1890.	1889.	Increase.
Traffic.....	\$1,508,747	\$1,309,477	\$199,270
Gross earnings.....	973,359	827,470	145,889
Oper. expen., excl. rent and int.....	\$535,388	\$482,007	\$53,381
Profit in operating.....	\$2,270,446	\$2,071,688	\$198,758

**Rome, Watertown & Ogdensburg.**—The certificate of the surrender of the capital stock of the Rome, Watertown & Ogdensburg Terminal road to this company, which was made before March 12, was filed with the Secretary of State at Albany, N. Y., this week.

**St. Louis, Arkansas & Texas.**—The Reorganization Committee has announced that parties who have not yet deposited their securities with the Central Trust Co., of New York, will be excluded from all benefits pertaining to the reorganization agreement. The first and second installments of assessment, amounting to 3 1/2 per cent. on the second mortgage gold certificates, and the first, second and third installment of assessment on stock, amounting to 7 1/2 per cent., were payable May 1. The holders of outstanding six per cent. first mortgage gold certificate coupons of May 1, 1889, will receive their face value and one year's interest at four per cent., in cash, from the committee after May, upon surrender to the committee of such coupons.

**Union Pacific.**—At the annual meeting of stockholders in Boston, April 30, after the election a stock vote was taken upon the ratification of the following: The modification of the Oregon Railway & Navigation Co. lease; the Oregon Short Line & Utah Northern traffic agreement; the guarantee of the Oregon Short Line & Utah Northern collateral trust bonds; the Union Pacific, Denver & Gulf traffic agreement; the Colorado Central trackage, Denver to Cheyenne, approving the 4 1/2 per cent. collateral trust Denver, Leadville & Gunnison mortgage indenture; the Chicago, Rock Island & Pacific Central trackage, Linden to Denver, etc.; the Kearney & Black Hills traffic agreement; the Chicago, Milwaukee & St. Paul trackage, from Council Bluffs to Omaha; the Chicago, Rock Island & Pacific trackage to Omaha and from Lincoln to Beatrice, Neb. The vote was 434,476 shares, all in favor of the above propositions.

## TRAFFIC.

### Chicago Traffic Matters.

CHICAGO, April 30, 1890.

There is a more hopeful feeling to-day than at any time for the past few weeks that the beginning of the end in regard to the rate disturbances is in sight. When the lines of the Western States Passenger Association adjourned, April 10, subject to the call of the chairman, it was understood that no further effort would be made looking toward a restoration of passenger rates until assurances were received that representation could be had from all the lines in the association. On April 26 another meeting was called for yesterday, at which all the lines were represented. There was a general discussion of the passenger situation, and the meeting went into committee of the whole in connection with the members of the Trans-Missouri Passenger Association to prepare articles of agreement for a general passenger association, embracing the territory of both the old associations. The committee remained in session until this evening, when it adjourned with the understanding that it shall present a report to a general meeting of passenger representatives of all lines west of the Mississippi River, to be called for May 6. The principal obstacle to the formation of a new association is now the Wisconsin Central, which demands either a differential fare or a reduction of speed by its competitors between Chicago and St. Paul, to a rate that it can maintain.

The Missouri Pacific and the Burlington have announced that they will place on sale to-morrow, May 1, round trip excursion tickets from the Missouri river to Colorado common points for \$25, limited to Oct. 31, with stop-over privileges west of the Missouri River. This is a reduction of \$5 below the rate of last season. Of course, at the present war rates this will not be taken advantage of.

It is reported that the Western Freight Association has about decided to abandon the Joint Agent's office at Kansas City, because some of the roads have not kept the agreement to participate in its expense, and also because recent action of some of the lines in regard to Trans-Missouri River rates has seriously interfered with the efficiency of the work of the office.

The Missouri Pacific has announced a rate of 3 1/2 cents on lumber from St. Louis to the Missouri River.

Rumors of additional cuts in passenger rates have been current on the street for some days, but they have not materialized. It is said that the scalpers have been purchasing large blocks of tickets at the present low rates in anticipation of an early advance.

The reduction of \$7.35 per car on live stock (mileage rebate) to Chicago and common points and \$4.80 per car to Mississippi River points from Trans-Missouri territory has been put into effect generally and has also been allowed from Omaha and St. Louis.

The Secretary of the Iowa State Board of Railroad Commissioners having advised the Western Freight Association that there is need for the extension of the reduced lumber rates in that State for distances over 400 miles, Chairman Faithorn has submitted to the lines the following proposed scale of rates per 100 lbs.: 410 miles, 9.2 cents; 420 miles, 9.4; 430 miles, 9.6; 440 miles, 9.8; 450 miles, 10 cents; 460 miles, 10.2; 470 miles, 10.4; 480 miles, 10.6; 490 miles, 10.8; 500 miles, 11 cents.

President Marvel, of the Atchison, is taking a trip through Texas, inspecting the lines of that company in that section.

## Traffic Notes.

The Canadian Pacific announces that it will put on through passenger trains between Montreal and Chicago, by way of its new line to Detroit, and thence over the Wabash, in June, and that Colonist sleeping cars will be run.

The quickest time ever made from New York City to Omaha by freight train is said to have been accomplished on a recent shipment of coffee via the Empire line and the Rock Island. The car left New York April 16 and was delivered in Omaha the morning of April 20.

The trunk lines have reduced the rates on iron, west bound, about 15 per cent. by changing the classification of various articles from fourth to fifth and from fifth to sixth class. This follows a corresponding reduction made by the Central Traffic Association last week.

The Kansas Railroad Commissioners have been called upon to decide a case similar to that brought before the Interstate Commission by the citizens of Lawrence. This case was brought by the citizens of North Topeka against the Rock Island for failing to stop its trains at North Topeka junction. The commissioners, after reviewing the case, refer to the decision of the Interstate Commerce Commission, and state that the facts are precisely similar. They therefore dismiss the complaint.

The Northern Pacific is about to put on an additional daily through passenger train between St. Paul and the Pacific coast. There are now three trains each way between St. Paul and Fargo, 251 miles from St. Paul, and two trains daily for 55 miles further, to Jamestown, N. D. Beyond that point there is only one train each way daily, except between Helena, Mont., and Missoula. The newspaper accounts say that the new train will run between Chicago and the Pacific coast in 18 hours' less time than the present schedule.

## The Interstate Commerce Commission.

The Commission, in an opinion by Commissioner Schoonmaker, has decided the case of Mattingly against the Pennsylvania Co. in favor of the defendant. This company operates the Jeffersonville, Madison & Indianapolis, and a branch of this road, lying wholly within the state of Indiana, forms the only connection at New Albany between the Louisville Evansville & St. Louis and the Louisville, New Albany & Chicago. At New Albany the Pennsylvania received complainant's grain from the L., E. & St. L., but refused to deliver it to the L., N. A. & C. for transportation to Louisville, preferring to take the freight to that point over the J., M. & I., its own road. The points decided are briefly stated as follows:

The proviso in the first section of the act to regulate commerce, that the provisions of the act shall not apply to the transportation of passengers or property wholly within one state, only excludes from regulation the purely internal commerce of a state, that which is confined within its limits, which originates and ends in the same state. When a state carrier engages in interstate commerce, it becomes a national instrumentality for the purpose of such commerce, and is subject to regulations prescribed by the national authority. It cannot limit its obligations in that business, but must serve the business offered impartially and without preference or discrimination. The national regulations prescribed are not in all respects coextensive with the power of Congress, and do not provide for ordering through routes and through rates. While it is the duty of a state carrier which engages in interstate commerce to forward traffic offered from a connecting line, there is no authority under the present act to compel the carrier to forward the traffic over a route not operated or selected by itself.

On Saturday, April 27, the Commission decided the case of Stone and Carten against the Detroit, Grand Haven & Milwaukee in favor of the complainants. This case involves the question of the lawfulness of free cartage of freight by railroad companies to and from one station on their lines and shippers' places of business when such free cartage is not given to shippers at another station on the same line taking the same grouped rate. The Commission rules that the practice is in effect the giving of a rebate from the regular published tariff rate, and in this case also violates the long and short haul clause of the law by making the charge for the shorter distance to Ionia, Mich., greater than to Grand Rapids, Mich., the longer distance. The railroad company is ordered to cease and desist from making such free cartage at Grand Rapids.

## Transportation of Soldiers.

On or about May 11, it is understood, there is to be a general change in the disposition of the regular army. The regiment at Governor's Island, New York, is to be transferred to San Francisco, and the regiment at San Francisco is to be transferred to New York. Two companies at Fort Porter, Buffalo, and two at Fort Wayne, Detroit, are to go to San Antonio, Tex.; and the detachment at San Antonio is to be transferred to Buffalo and Detroit. This business is not subject to the rules of the Interstate Commerce law concerning publication of rates, and there is general competition to secure some of it.

## East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, April 26, amounted to 72,633 tons, against 72,405 tons during the preceding week, an increase of 228 tons, and against 39,457 tons during the corresponding week of 1889, an increase of 33,176 tons. The proportions carried by each road were:

	Wk to Apr. 26.		Wk to Apr. 19.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	8,431	11.6	6,191	8.6
Wabash.....	3,921	5.4	3,866	5.3
Lake Shore & Michigan South.....	13,162	18.1	13,256	18.3
Pitts., Ft. Wayne & Chicago.....	7,027	9.7	7,505	10.4
Chicago, St. Louis & Pitts.....	7,488	10.3	9,574	13.2
Baltimore & Ohio.....	4,142	5.7	4,484	6.2
Chicago & Grand Trunk.....	8,822	12.2	9,795	13.5
New York, Chic. & St. Louis.....	7,921	10.9	7,869	10.9
Chicago & Atlantic.....	11,719	16.1	9,853	13.6
Total.....	72,633	100.0	72,405	100.0

Of the above shipments 2,650 tons were flour, 37,892 tons grain, 2,596 tons millstuffs, 5,029 tons cured meats, 2,159 tons lard, 9,519 tons dressed beef, 1,224 tons butter, 1,438 tons hides, 111 tons wool and 6,472 tons lumber. The three Vanderbilt lines carried 40.6 per cent. of all the business, while the two Pennsylvania lines carried but 20 per cent.